Acknowledgements and further information:

This analytical country report is one of a series of annual ERAWATCH reports which are produced for EU Member and Countries Associated to the EU Seventh Research Framework Programme (FP7). ERAWATCH is a joint initiative of the European Commission’s Directorate General for Research and Innovation and Joint Research Centre.

The analytical framework and the structure of the reports have been developed by the Institute for Prospective Technological Studies of the Joint Research Centre (JRC-IPTS) with contributions from Directorate General for Research and Innovation and the ERAWATCH Network. The report has been produced by the ERAWATCH Network in the framework of the specific contract, ERAWATCH Research Inventory and Analytical Country Reports 2010 and 2011, commissioned by JRC-IPTS.

In particular, the authors acknowledge the critical, but constructive, comments and suggestions made by the reviewer for this report, Paul Cunningham. The contribution and comments of Luisa Henriques from JRC-IPTS and DG-RTD are also gratefully acknowledged. The information in this report is based upon primary and secondary sources. The contacts with the Department of European, Bilateral and Multilateral Relations of FCT (Portuguese Science and Technology Foundation) and with GPPQ (Office for Promotion of the 7th EU RTD Framework Programme) were critical to obtain the necessary information. In particular, we wish to acknowledge the extensive interviews with Ana Faisca and José Bonfim (both from FCT) and support provided by Paulo Madeira from the Portuguese Innovation Agency (AdI).

The report is only published in electronic format and available on the ERAWATCH website. Comments on this report are welcome and should be addressed to jrc-ipts-erawatch-helpdesk@ec.europa.eu.

The opinions expressed are those of the authors only and should not be considered as representative of the European Commission’s official position.
Executive Summary

Portugal has a population of 10.6 million people, corresponding to 2.1% of the EU27. In 2009 per capita GDP expressed in purchasing power parities was 79% of the EU27 average. Real GDP growth has been very weak throughout the present decade, forecasts for 2010 and 2011 being rather low, according to Eurostat. In spite of Portugal’s economic weaknesses and the current economic and financial crisis, both GERD (Gross Expenditure in Research and Development) and BERD (Business Expenditure in Research and Development) experienced significant growth rates. GERD reached 1.7% of GDP, in 2009, as against 0.83% for 2003. BERD amounted to 0.8% of GDP, while the corresponding figure for 2003 was 0.2% only (GPEARI, 2010b, 2009b).

The measures which have been promoted in the context of the National Strategic Reference Framework (NSRF) 2007-2013 to stimulate Research and Development (R&D) address the main concerns that exist in this domain. However there are problems related to the capacity of the existing business firms exploiting the possibilities by the present policy mix. This is further aggravated by the current economic climate, which inhibits firms of investing and adopting a more innovative behavioural posture.

The main barriers to private R&D investments are associated to five main features: (1) The structural characteristics of the economic fabric; (2) the size distribution of Portuguese firms, where very large firms, which typically have greater R&D intensity, are absent; (3) the nature of the domestic demand (intermediate and capital goods demand patterns are less sophisticated than European average, so hindering the local companies supplying advanced products); (4) average company absorptive capacity is relatively weak, not only in terms of purchasing advanced inputs but also in terms of integrating in their staff qualified human resources; and (5) the insufficient development of the venture capital market. Besides these barriers, a reference is due to the insufficient applicability concerns that still dominate research policy. Despite a recent move to more targeted initiatives, the situation is still far from a healthy collaboration between academic research and potential users. This is a systemic problem, which is related to both the orientation of the policies and the weak absorptive capabilities of the economic fabric.

Knowledge Triangle

Portuguese research policy has followed a consistent path, aimed at internationalizing, strengthening and improving the quality of the Portuguese research system. Budgetary allocations to S&T have experienced a growth trend and were kept broadly constant for 2011, in spite of heavy budgetary constraints. The measures taken in the period under review are consistent with those long term objectives. An interesting feature is the trend towards an increased targeting of research, though the dominant picture is still one of broad range support.

An integrated policy approach to the ‘knowledge triangle’ is lacking. The discontinuation of the Technological Plan and the ineffective coordination of the NSRF have not enabled clear improvements in policy coordination, particularly on what concerns research and innovation policies.

The table below provides a synthesis of the main developments with regard to ‘knowledge triangle’ policies, assessing the country’s strengths and weaknesses.
Effectiveness of knowledge triangle policies

<table>
<thead>
<tr>
<th>Research policy</th>
<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
</table>
|                 | • New research laboratories  
|                 | • Strengthening of Internationalization  
|                 | • Recruitment of foreign researchers  
|                 | • Increasing targeting of research (although the dominant pattern is still a broad range approach)  
|                 | • Developments are in general positive and likely to contribute to strengthen the research system. Recruitment of young foreign researchers is likely to strengthen future international networking.  
|                 | • The downside is related to the insufficient concern with research exploitability, the difficulty in offering attractive research career prospects to young Portuguese researchers and the low involvement of the business community and the society as a whole in defining research priorities. |

<table>
<thead>
<tr>
<th>Innovation policy</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
</table>
| • Cluster approaches  
| • R&D teams and R&D centres  
| • Discontinuation of the Technological Plan  
| • Strengths are related to the existence of a broad range of instruments to promote investment, technological cooperation and the upgrading of firms’ in-house research capabilities.  
| • The discontinuation of the Technological Plan deprived innovation policy from a horizontal instrument to coordinate policies and to bring together the various stakeholders. The performance of several Competitiveness and Technology Poles (CTPs) and Clusters appears to be weak. |

<table>
<thead>
<tr>
<th>Education policy</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
</table>
| • Reform of the Universities  
| • Changes in University teaching career statute  
| • Development of vocational training  
| • The changes go in the right direction, reducing University ‘closure’ and ‘corporatism’, and making Universities more open to society as a whole. A positive feature of the university teachers’ career statute is the opening of opportunities for outside cooperation.  
| • The main weaknesses are related to the fact that the reform of that statute was somewhat ‘conservative’. It has not entailed a clear break with regard to the previous status quo. |

<table>
<thead>
<tr>
<th>Other policies</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
</table>
| • Tax policy (decision to keep SIFIDE)  
| • Physical Infrastructures policy: due to current budgetary constraints policy remains uncertain with regard to pursuing envisaged infrastructural investments  
| • The keeping and reinforcement of SIFIDE is a sign of commitment to encourage company R&D investments.  
| • A clear policy to profit from infrastructural investments is lacking, thereby hindering application oriented R&D and innovation initiatives.  
| • Public procurement is yet insufficiently used as a tool to promote R&D and innovation. |

European Research Area (ERA)

The Portuguese position with regard to ERA has been supportive in general terms. The headlines of research policy are broadly in line with ERA 2020 objectives. Investment in science is generating fruits as the performance of the scientific system has been improving. There are, however, problems in several aspects, including: exploitability of research, involvement of stakeholders in the definition of research objectives, structural change, and ‘knowledge triangle’ policy coordination. A summary of the main policy changes and strengths and weaknesses according to the 15 objectives defined in the vision 2020 for ERA is presented below.
## Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main national policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
</table>
| 1 Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers | * Continuation of a strong investment of doctoral and post-doctoral education.  
* Profiting from the recruitment programme to attract foreign researchers.  
* Launch of the ‘Welcome II Portugal’ in order to attract European researcher with working experience in third countries.  
* Creation of two large internationally orientated laboratories.                                                                 | + Portugal is increasingly competitive for foreign researchers in the 30- to 40-years old cohort.  
+ High share of female researchers  
+ Strong growth in the share of PhD holders in active population.  
− Difficulty in generating employment and promising career prospects for young PhD holders.                                                                                             |
| 2 Increase public support for research                                         | * Public S&T budget for 2011 has not declined with regard to 2010, in spite of the crisis.  
* Continuation of SIFIDE, the tax system to promote company R&D.                                                                                                                     | + Budgetary decisions show a commitment to support R&D activities.  
− Insufficient stakeholder involvement in the definition of S&T policy priorities.  
− Weak concern with research exploitability.                                                                                                                                                |
| 3 Increase European coordination and integration of research funding           | * Participation in ERA-NETs and other European initiatives.  
* Bi- and multi-lateral cooperation with other ERA countries.                                                                                                                         | + Positive contribution of ERA-NETs and other initiatives for an increased involvement of Portuguese research groups.                                                                                                                                     |
| 4 Enhance research capacity across Europe                                      | * Creation of Iberian International Nanotechnology Laboratory (INL).                                                                                                                                                              | + Commitment to lead European research in dynamic fields (nanosciences and nanotechnologies).  
+ Iberian cooperation.                                                                                                                                                                          |
| 5 Develop world-class research infrastructures (including e-infrastructures) and ensure access to them | * Creation of INL.  
* Creation of Champallimaud Research Centre (this stems from a decision of a new well-endowed private foundation).                                                                 | + Contribution towards the development of international research infrastructures.                                                                                                                                                                      |
| 6 Strengthen research institutions, including notably universities            | * Consolidation of the support to research units and Associate Laboratories.  
* Evaluation of Associated Laboratories.  
* Launching of thematic research networks.  
* Reform of the Universities.  
* Review of the University career statute.                                                                                                                                             | + Promotion of quality and excellence standards in knowledge production.  
+ Stimulation of economies of scale and inter-disciplinary research.  
+ Opening of Universities to society  
+ Increased opportunities for University-industry cooperation.  
− Some knowledge held by government laboratories was lost.  
− Reform of university teaching career statute more timid than expected.                                                                                                                     |
<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main national policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
</table>
| 7 Improve framework conditions for private investment in R&D                   | • Measures to promote individual company and collaborative R&D projects in the context of the NSRF 2007-2013.  
|                                                                                | • Continuation of SIFIDE.  
|                                                                                | • Clusters initiative.                                                                                                                                                                                                                                                                                                                                                                                   | • + Improved conditions for companies to invest in R&D.  
|                                                                                | • + Promotion of R&D cooperation around common themes.  
|                                                                                | • – Excessive bureaucracy.  
|                                                                                | • – Insufficient support and strategic follow up of the development of Competitiveness and Technology Poles (CTPs) and clusters.                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                 |
| 8 Promote public-private cooperation and knowledge transfer                    | • Continued promotion of university-industry R&D consortia.  
|                                                                                | • Clusters initiative.  
|                                                                                | • Creation of the Technology Demand and Supply Marketplace.                                                                                                                                                                                                                                                                                                                                                   | • + Provision of opportunities for research organisations and companies to meet and cooperate.                                                                                                                                                                                                                    |• – Linear approach, assuming that knowledge may be ‘transferred’ as such, instead of being shared and changed/adapted through interaction.  
|                                                                                | • – Discontinuation of support to Technology Transfer Offices (TTOs).                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                 |
| 9 Enhance knowledge circulation across Europe and beyond                        | • Sustained support to the internationalization of research.  
|                                                                                | • Recruitment of foreign researchers.  
|                                                                                | • ‘Partnerships for the Future’ with US Universities and Fraunhofer Gesellschaft.  
|                                                                                | • Promotion of participation in FP7.  
|                                                                                | • Creation of the UNESCO Centre for doctoral education of Portuguese speaking researchers.                                                                                                                                                                                                                                                                                                                          | • + Increased worldwide openness of the Portuguese research system.  
|                                                                                | • + Increased opportunities for (reciprocal) learning..  
|                                                                                | • – Potential dispersion of effort.  
|                                                                                | • – There may be a potential tension between the agreements with US universities and European research policy, since such partnerships address several areas with European value added.                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                 |
| 10 Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world | • Creation of INL (and launching of the private Champalimaud Centre).  
|                                                                                | • Attraction of foreign researchers.  
<p>|                                                                                | • Creation of the UNESCO Centre for doctoral education of Portuguese speaking researchers.                                                                                                                                                                                                                                                                                                                         | • + All these initiatives contribute to improve Portugal’s role and attractiveness in European and worldwide research landscape. By the same token, they positively contribute to international cooperation and to enhance European research attractiveness and status.                                                                                                                                         |</p>
<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main national policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
</table>
| 11 Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle | • Increased coordination of research and innovation policy measures under the 2007-2013 NSRF.  
• Cluster approaches.  
• Discontinuation of the Technological Plan.                                                                                                                                                                                                                                                                                                                                 | + Existence of new formal instruments for policy coordination, although having a limited impact.  
+ Cluster policy as an instrument to put together the elements of the knowledge triangle.  
− The institution of formal coordination mechanisms may not be enough to ensure effective coordination.  
− The discontinuation of the Technological Plan deprived the government from effective mechanisms to ensure a proper coordination between research and innovation policies. |
| 12 Develop and sustain excellence and overall quality of European research    | • Continuation of the commitment to quality and excellence in research.  
• Creation of INL (and launching of the Champallimaud Centre).                                                                                                                                                                                                                                                                                                                                 | + The focus on quality and excellence in research is one of the key strengths of Portugal's research policy.  
+ This has also positive implications for the quality and excellence of European research as a whole.                                                                                                                                                                                                                                                                           |
| 13 Promote structural change and specialisation towards a more knowledge-intensive economy | • Policy initiatives regarding the spread of ICT, the development of electrical mobility and research in nanotechnologies are aimed at promoting structural change and a drive towards a more knowledge-intensive economy.                                                                                                                                                                               | + Consensus about the need to invest in research and innovation to bring about structural change.  
+ There is an increasing crust of internationally competitive knowledge-intensive firms.  
+ A public procurement policy seems to be emerging.  
− The move has been too slow to bring about clear structural change.  
− Insufficient capacity to attract knowledge- and R&D-intensive Foreign Direct Investment.                                                                                                                                                                                                                                    |
| 14 Mobilise research to address major societal challenges and contribute to sustainable development | • Increased focus on research targeted to societal challenges  
• Concern with the development of, and research on, renewable sources of energy.                                                                                                                                                                                                                                                                                                                                 | + There is a partial overlap between Portugal’s research targets and the “grand challenges” of the Lund Declaration.  
+ Significant improvements in the use of renewable sources of energy  
− Lack of involvement of stakeholders and the society as a whole in the identification of the key societal challenges to be addressed by research policy.                                                                                                                                                                                                                      |
| 15 Build mutual trust between science and society and strengthen scientific evidence for policy making | • Sustained commitment to the diffusion of scientific culture, namely through the ‘Ciência Viva’ initiative.                                                                                                                                                                                                                                                                                                                                             | + Diffusion of scientific culture  
+ Improved capacity to attract youngsters to follow scientific careers.  
− In spite of some improvements, the use of scientific evidence for policy making remains limited.                                                                                                                                                                                                                                                                               |
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Summary</td>
<td>3</td>
</tr>
<tr>
<td>1 Introduction</td>
<td>10</td>
</tr>
<tr>
<td>2 Performance of the national research and innovation system and</td>
<td>10</td>
</tr>
<tr>
<td>assessment of recent policy changes</td>
<td></td>
</tr>
<tr>
<td>2.1 Structure of the national research and innovation system and its</td>
<td>10</td>
</tr>
<tr>
<td>governance</td>
<td></td>
</tr>
<tr>
<td>2.2 Resource mobilisation</td>
<td>13</td>
</tr>
<tr>
<td>2.2.1 Resource provision for research activities</td>
<td>13</td>
</tr>
<tr>
<td>2.2.2 Evolution of national policy mix geared towards the national R&amp;D</td>
<td>14</td>
</tr>
<tr>
<td>investment targets</td>
<td></td>
</tr>
<tr>
<td>2.2.3 Providing qualified human resources</td>
<td>16</td>
</tr>
<tr>
<td>2.3 Knowledge demand</td>
<td>17</td>
</tr>
<tr>
<td>2.4 Knowledge production</td>
<td>18</td>
</tr>
<tr>
<td>2.4.1 Quality and excellence of knowledge production</td>
<td>18</td>
</tr>
<tr>
<td>2.4.2 Policy aiming at improving the quality and excellence of knowledge production</td>
<td>19</td>
</tr>
<tr>
<td>2.5 Knowledge circulation</td>
<td>20</td>
</tr>
<tr>
<td>2.5.1 Knowledge circulation between the universities, PROs and</td>
<td>20</td>
</tr>
<tr>
<td>business sectors</td>
<td></td>
</tr>
<tr>
<td>2.5.2 Cross-border knowledge circulation</td>
<td>22</td>
</tr>
<tr>
<td>2.5.3 Main societal challenges</td>
<td>23</td>
</tr>
<tr>
<td>2.6 Overall assessment</td>
<td>23</td>
</tr>
<tr>
<td>3 Interactions between national policies and the European Research Area</td>
<td>26</td>
</tr>
<tr>
<td>3.1 Towards a European labour market for researchers</td>
<td>26</td>
</tr>
<tr>
<td>3.1.1 Stocks and mobility flows of researchers</td>
<td>27</td>
</tr>
<tr>
<td>3.1.2 Providing attractive employment and working conditions</td>
<td>28</td>
</tr>
<tr>
<td>3.1.3 Open recruitment and portability of grants</td>
<td>29</td>
</tr>
<tr>
<td>3.1.4 Meeting the social security and supplementary pension needs of</td>
<td>30</td>
</tr>
<tr>
<td>mobile researchers</td>
<td></td>
</tr>
<tr>
<td>3.1.5 Enhancing the training, skills and experience of European</td>
<td>31</td>
</tr>
<tr>
<td>researchers</td>
<td></td>
</tr>
<tr>
<td>3.2 Research infrastructures</td>
<td>31</td>
</tr>
<tr>
<td>3.2.1 National Research Infrastructures roadmap</td>
<td>32</td>
</tr>
<tr>
<td>3.2.2 National participation in the ESFRI roadmap. Updates 2009-2010...</td>
<td>32</td>
</tr>
<tr>
<td>3.3 Strengthening research institutions</td>
<td>33</td>
</tr>
<tr>
<td>3.3.1 Quality of National Higher Education System</td>
<td>33</td>
</tr>
<tr>
<td>3.3.2 Academic autonomy</td>
<td>34</td>
</tr>
<tr>
<td>3.3.3 Academic funding</td>
<td>35</td>
</tr>
<tr>
<td>3.4 Knowledge transfer</td>
<td>35</td>
</tr>
<tr>
<td>3.4.1 Intellectual Property Policies</td>
<td>35</td>
</tr>
</tbody>
</table>
3.4.2 Other policy measures aiming to promote public-private knowledge transfer......................................................... 36

3.5 Cooperation, coordination and opening up national research programmes within ERA........................................................ 38

3.5.1 National participation in intergovernmental organisations and schemes........................................................................ 38

3.5.2 Bi- and multilateral agreements with other ERA countries ....... 38

3.5.3 Other instruments of cooperation and coordination between national R&D programmes............................................. 39

3.5.4 Opening up of national R&D programmes ............................................. 41

3.6 International science and technology cooperation ......................... 42

3.6.1 International cooperation................................................................... 42

3.6.2 Mobility schemes for researchers from third countries ................ 43

4 Conclusions............................................................................................... 43

4.1 Effectiveness of the knowledge triangle ............................................. 43

4.2 ERA 2020 objectives - a summary ....................................................... 44

References .................................................................................................... 49

List of Abbreviations .................................................................................... 50
1 Introduction

The main objective of the ERAWATCH Analytical Country Reports 2010 is to characterise and assess the evolution of the national policy mixes in the perspective of the Lisbon goals and of the 2020, post-Lisbon Strategy. The assessment will focus on the national R&D investments targets, the efficiency and effectiveness of national policies and investments into R&D, the articulation between research, education and innovation, and on the realisation and better governance of ERA. In doing this, the 15 objectives of the ERA 2020 are articulated.

The report builds on the 2009 report streamlining the structure and updating the 2009 policy assessment in the domains of human resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. The information related to the four ERA pillars covered in the 2009 report is also updated and it is extended in order to cover all six ERA pillars and address the corresponding objectives derived from ERA 2020 Vision.

Given the latest developments, the 2010 Country Report has a stronger focus on the link between research and innovation, reflecting the increased focus of innovation in the policy agenda. The report is not aimed to cover innovation per se, but rather the 'interlinkage' between research and innovation, in terms of their wider governance and policy mix.

2 Performance of the national research and innovation system and assessment of recent policy changes

The aim of this chapter is to assess the performance of the national research system, the 'interlinkages' between research and innovation systems, in terms of their wider governance and policy and the changes that have occurred in 2009 and 2010 in national policy mixes in the perspective of the Lisbon goals. The analysis builds upon elements in the ERAWATCH Country Report 2009, by updating and extending the 2009 policy assessment in the domains of resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. Each section identifies the main societal challenges addressed by the national research and innovation system and assesses the policy measures that address these challenges. The relevant objectives derived from ERA 2020 Vision are articulated in the assessment.

2.1 Structure of the national research and innovation system and its governance

With a population of 10.6 million people, Portugal has a 2.1% share of the EU population. GDP share is smaller, standing at 1.6% of the overall EU GDP. This corresponds to a GDP per capita which is 79.3% (in ppp) of the EU average.

The national R&D survey for 2009 indicates that total GERD has reached €2.79b, reflecting a nominal growth of 8% in relation to 2008 (below the 31% growth rate for the previous year) and bringing the GERD/GDP ratio to 1.71% (GPEARI, 2010b). This
means that the Portuguese share in the overall EU GERD (slightly above 1.0%) is still below both its population and GDP shares.

**Main actors and institutions in research governance**

The governance structure of the Portuguese research system has been kept stable over the last few years. The leading institution in the governance of the research system is the Ministry for Science, Technology and Higher Education (MCTES). MCTES manages by far the most significant stake in the national S&T budget. It has implemented in recent years two important policies with significant impact on the research sector: the reform of the government labs, and the establishment of a new universities’ governing law together with the new university career statute.

The Parliament in Portugal has not had an active role in research policies. Members of Parliament see research problems as a topic far from mundane political issues, and normally discuss research policies only when called to pass a law which needs parliamentary backing. However, recently this situation seems to be changing. A Parliamentary report on research policy was published and discussed in a public session with the relevant stakeholders.

Despite a growing importance by both their contribution to national development and involvement with the local communities, universities often act together in relation to major issues. They have been adapting to the law passed in 2008 that has modified their legal regulation. This law potentially provides them with higher levels of autonomy, both in spending and raising funds. A significant part of the research carried out in Portugal is performed by the universities or in the private non-profit entities which operate in their orbit.

The Government Labs sector has suffered a significant downsizing in the last two decades, mainly due to the lack of a clear policy. This has been partially compensated by the development of the Associate Labs, which have emerged mainly from the merger of university research centres. The reform of the government labs sector has advocated a greater coordination of activities between these two types of labs. Such coordination has been materialising in the context of disciplinary consortia established by both parts.

Overall the research governance model can be characterised as being dominated by a top down approach, with few participatory mechanisms for the involvement of interest groups, business, Non-Governmental Organisations and the society in general. The advisory body of S&T policy, which is foreseen in the MCTES statute to bring together different societal sectors, has not yet appointed its members. The figure in the next page portrays the national research system and its governance.

**The institutional role of regions in research governance**

The national S&T budget is centrally coordinated by MCTES. The governing bodies of the regions in mainland Portugal are appointed centrally and have little role in research orientation. The same however does not apply to Azores and Madeira, which have governments elected by the regional vote and have their own departments overseeing S&T. However, FCT (the S&T Foundation, which acts as a research council) certificated research units operating in those regions also benefit from MCTES programme support.
Main research performing groups

The structure of research as regards the sectoral breakdown of GERD remained stable until a few years ago. The funding structure for 2005 reflected the traditional status-quo. In 2005, the Government sector was still in the lead position, with a 56% of the total funding of R&D, while the Business sector was second with 36%. The remaining funding sectors (“Abroad”, “Private non-profit”, and “Higher Education”) were at a significant distance (respectively with 5%, 2% and 1%). If one takes the GERD performers perspective, the Business sector led with 38%, slightly ahead the Higher Education sector with 35%. The Government and the Private non-profit sectors were both quite below the former, with 15% and 12%, respectively.

With reference to the most recent data available, the structure of research as regards the regional breakdown of 2007 GERD shows a strong concentration in the Lisbon, Norte and Centro regions (respectively 56.5%, 30.5% and 11.3%). All the remaining 4
regions (including Azores and Madeira) are below 1% of national GERD (GPEARI, 2009b).

The figures for recent years show a decline of the Government sector GERD share. According to 2009 data, the Business sector is now significantly ahead, (47%) while the Higher Education sector, despite a rising nominal expenditure, experienced a drop to 35%. The Government felt a significant decline, to 7% only (GPEARI, 2010b).

2.2 Resource mobilisation

Since 2000, Europe has made evident progress towards ERA but at the same time it is clear that Europe's overall position in research has not improved, especially regarding R&D intensity, which remains too low. The lower R&D spending in the EU is mainly a result of lower levels of private investment. Europe needs to focus on the impact and composition of research spending and to improve the conditions for private sector R&D investments.

This section assesses the progress towards national R&D targets, with particular focus on private R&D and of recent policy measures and governance changes and the status of key existing measures, taking into account recent government budget data. Most of those measures are promoted within the NSRF 2007-2013, with the support of EU Structural Funds. The need for adequate human resources for R&D has been identified as a key challenge since the launch of the Lisbon Strategy in 2000. Hence, the assessment includes also the human resources for R&D. Main assessment criteria are the degree of compliance with national targets and the coherence of policy objectives and policy instruments.

2.2.1 Resource provision for research activities

Portugal has shown a long term commitment towards increasing research investment. Taking as a reference the EU2020 strategy the country has identified to reach a GERD target of between 2.7% and 3.1% of the GDP by 2020, which will put the country at the same level as the EU overall. This is a very ambitious target, which risks to be missed given the current structural conditions.

Despite such long term commitment, no multi-annual RDI spending plans have been announced. Decisions on public spending are taken annually and they are only temporarily constrained by the need to coordinate spending with the structural funds delivered under the National Strategic Reference Framework (NSRF).

'Public' funding for R&D in Portugal has had its origins in two main sources: the national budget and European funds. The first source is the most important. It encompasses direct allocations, corresponding to GBAORD, and indirect ones, corresponding to tax incentives to R&D. European funds come second: in the 2007-2013 NSRF’s ‘Compete’ programme, the amount assigned to Axis 1, focused on ‘Knowledge and Technological Development’, corresponds to €500m. On the top of that amount the European Regional Development Fund (ERDF) financial resources assigned to R&D activities in the context of the Regional Plans should be added.

Drawing on information supplied by the MCTES it is possible to get a general perspective of GBAORD evolution and structure. GBAORD experienced a significant increase, from €1,272m in 2007 to €1,765m in 2010. In this period, the share of R&D in the total Government budget has grown from 2.6% to 3.1%, while the ratio between GBAORD and GDP improved from 0.78% to 1.05%. Such recent evolution
together with the 2020 target highlighted above, indicate a clear commitment towards ERA objective #2 (increase public support for research). In what refers to 2011, the national budget was marked by a decline of 3.2% in the overall resources under the MCTES. However, that budget contraction was not proportionally distributed as Higher Education has suffered a 10% drop, while other areas (including research funding) kept their expenditure at least at the same level as in 2010.

A caveat is needed with regard to the GBAORD structure. In the absence of detailed statistics, an estimation exercise was carried out, based on available data as well as on historical trends. An analysis by type of financing shows the dominance of the ‘Institutional support’, which at 47% accounts for almost one half of GBAORD for 2009 (for 2007 its weight was even higher, reaching around 58%). The share of ‘Project-based funding’ corresponded to about one quarter of the total for 2009.

There are, however, signs that ‘targeted and thematic funding’ will increase in the future (thus contributing to ERA objective #8, Promote public-private cooperation and knowledge transfer). Such conjecture is based on four arguments. First, the reform of the government laboratories identified several scientific and technological fields requiring a stronger focus. A call was launched for the creation of R&D consortia in six specific fields. Second, the agreements with several US Universities and the Fraunhofer Gesellschaft address well defined thematic areas. Third, the creation of the Iberian Nanotechnologies Laboratory (INL) portrays a specific concern with this scientific field. Fourth, an increased involvement in international collaborative initiatives, such as the ERA-NETs, has also revealed a growing focus on specific themes.

Despite the growing interest on specific priorities, there is not however a thorough involvement across all the research themes identified by the Lund declaration. Themes such as clean energy, sustainable transport, environmental risks and health concerns with an ageing population are the ones which have been addressed by recent policy initiatives in Portugal. However, the selection of priorities does not stem from a broader participatory process involving the society at large, through which business interests, citizens groups or scientists’ organisations are consulted about this issue (Godinho and Simões, 2009). The evidence is thus that on ERA objective #15 (Mechanisms to build mutual trust between science and society and strengthen scientific evidence for policy making) the progress is not very significant.

2.2.2 Evolution of national policy mix geared towards the national R&D investment targets

The evolution of BERD in Portugal in recent years has been quite positive. While over all the 1980s the BERD/GDP ratio was stuck below 0.1%, it started to grow henceforth at a moderate speed, reaching 0.31% by 2005, and then accelerating more recently to 0.78% and 0.80%, respectively in 2008 and 2009 (GPEARI, 2009b, 1 For more specific information on this exercise, see the ERAWATCH Inventory
This recent increase stems from two main causes. Firstly, the coverage of the national R&D survey has improved. Secondly, and more importantly, the SIFIDE programme of fiscal credits has had an important short-term impact with a number of firms willing to benefit from those fiscal credits (see this report). In Portugal, the launch of the NSRF 2007-2013 entailed several changes to the portfolio of measures to support R&D, which was analysed in the country review undertaken in the context of the ‘Policy Mixes’ project (see Simões et al. 2007). The NSRF brought about major changes, with a revision of the support measures. What follows immediately covers therefore the policy mixes which have been pursued.

In order to stimulate the establishment of new indigenous R&D performing firms, several initiatives have been taken along the last decade. In the context of the NSRF, the most important regards ‘Entrepreneurship Projects’. At regional level, measures intended to promote Science and Technology Parks and incubator facilities.

To stimulate the creation of firms’ in-house R&D capabilities the ‘Compete’ programme includes two measures: ‘R&D Teams’ and ‘R&D Centres’.

The attraction of technologically sophisticated FDI has figured high in Portuguese economic policy, especially since the late 1970s, with some successful examples. However, the general panorama has been of a low degree of attracting many more R&D performing firms. Further, it should be pointed out that given EU rules of establishment, there are no incentives systems exclusively addressed to this objective. However, the introduction of a ‘Special Projects’ (above €15m) regime under the RTD Incentive System in 2008 may allow additional leverage to court and attract R&D performing FDI.

Another objective which has been pursued is to increase extramural R&D carried out in cooperation with the research sector. The NSRF entailed a much stronger focus on this objective, being the main measure the establishment of the ‘collective efficiency strategies’ (aiming at stimulating different forms of cooperation and clustering among different actors). Further measures aiming at this objective include: ‘Collective RTD projects’ (led by business associations to respond the technology development needs of their members); ‘Mobilising projects’ (involving companies and R&D organisations); ‘Co-promotion projects’, (again through partnerships between companies and RTD organisations); ‘R&D Consortia’ (usually led by R&D organisations, to develop specific research projects involving research organisations and business firms); and ‘RTD Voucher’ (granted to a company to benefit from R&D services).

It is possible to point out that the measures which have been promoted in the context of the NSRF 2007-2013 to stimulate private R&D address the main concerns that exist in this domain. The Portuguese public administration has a significant experience in managing programmes co-financed by the ERDF, the ESF and the Cohesion Fund, and this translates into a machinery that works reasonably well, although some ‘red tape’ still remains. The programmes are well publicized and the access to application is relatively easy and clear. Some possible improvements have been highlighted by the NSRF 2007-2013 mid-term evaluation (IESE-Quaternaire, 2010). However the main problem these days seems to be more related to the demand conditions and to the capacity of the existing business firms exploiting the possibilities of the available measures. This situation is aggravated by the economic climate, which inhibits firms from investing and adopting a more innovative attitude.

In addition to the measures reviewed above that have been implemented under the NSRF 2007-2013, there are other policy measures that also affect R&D investment.
The most important of such policies has by far been SIFIDE, a system providing tax credits to investments in R&D. This measure, which has existed now by a decade with a brief interruption in 2005, was reinforced by 2009 the Portuguese Initiative for Investment and Employment, which provided a significant increase in SIFIDE support rates. The system was further changed by the Budget Law for 2011, being now called SIFIDE II. While until a few years ago there was no organised public procurement of innovative goods and services, awareness is emerging about the potential of this policy tool. The most striking example is the implementation of the Magalhães computer project. This project involved the development of a very basic portable notebook computer to be distributed among school children aged 7-10 years old. In the absence of an independent evaluation, it is difficult to say whether it is effectively stimulating the R&D and technological capabilities of domestic manufacturers.

Despite the recent advances and the policy efforts which have been put forward several important barriers and risks remain so that the Portuguese economy may be able to move forward in direction of the 2% BERD target. The first of those barriers has to do with the structural characteristics of the economic fabric. Portuguese specialization has evolved from low-tech preponderance until the 1980s to a structure of production and exports which is now dominated by medium-tech industries. However there are signs of a structural stickiness and incapacity of moving towards higher technology and knowledge intensities. The current economic recession represents a risk that such process of transformation might be slowed down. A second related barrier concerns the size distribution of Portuguese firms, where very large firms, which typically have greater R&D intensity, are absent. A third barrier is related to the nature of the domestic demand. Intermediate and capital goods demand patterns are less sophisticated than in the most developed economies, so hindering the local companies supplying advanced products. Further as one gets to the traditional smaller-sized companies, their absorptive capabilities become weaker, not only in terms of purchasing advanced inputs but also in terms of integrating in their staff people with higher education degrees. The underdevelopment of the venture capital market is a fourth barrier. Despite improvements in recent years, the culture is still far from a virtuous relationship between capital providers and the capital users. Moreover the fraction of capital provided by business angels is residual. A last barrier concerns the continuing insufficient application of research policy and public funding of research. Despite a recent move to more targeted initiatives, the situation is still far from a healthy collaboration between academic research and potential users.

### 2.2.3 Providing qualified human resources

The conditions in the research labour market have been changing fast in recent years, reflecting in part, with a gap of several years, what has been happened before in the general labour market. While traditionally those getting a job in both the higher education system and in the public research labs were offered the possibility of pursuing a career where clear stages of advancement were visible, in a context of long-term employment security, now such situation is no more the dominant one. These changes have happened along a swift expansion of the research labour market, which was possible through the decades-long policy of investing in the training of new doctorates and, more generally, increasing the supply of new graduates in S&T.
The human resources in S&T (HRST) as a share of the economically active population in the age group 25-64 has increased from 17.3% in 2000 up to 23.5% in 2009. These figures compare with a EU27 average for both years of, respectively, 34.1% and 40.0%. This indicator gives the percentage of the total labour force in the age group 25-64, that is classified as HRST, i.e. having either successfully completed an education at the third level in an S&T field of study or is employed in an occupation where such an education is normally required (Eurostat).

For decades there has been a ‘divide’ between research and enterprise policies (Godinho & Simões, 2005). In recent years the situation has improved although an integrated, systemic approach is still to be developed. Nevertheless, there is a growing recognition of the relevance of the Knowledge triangle, linking Research, Innovation and Education. To some extent the launching of the Technological Plan in 2006 (which has meanwhile been discontinued) could have been perceived as an instrument to coordinate and foster the inter-action between the three sides of the Triangle (Caraça & Simões, 2008). In the same vein, the NSRF 2007-2013 has been able to put under the same Operational Programme the incentive systems addressed to science and enterprise policies.

Among the specific policy instruments to bridge the three policy domains of education, research and innovation, the “collective efficiency strategies” is the most important. They have the potential to create dynamic linkages among those domains, fostering cooperation and synergies among the different players. The transformation of such a potential into actual change cannot however be taken for granted.

The commitment to the development of post-graduate education has been evident throughout the last three decades. The creation of the MCTES also stems from the recognition of the need to appropriately combine Higher Education and Science policies. The achievement of a large pool of PhDs was envisaged as a pre-condition for the development of the R&D system.

Notwithstanding the existence of several universities performing relatively well, with education standards equal to those adopted by leading universities worldwide, there are still many higher education institutions performing poorly. The best institutions have taken aspects such as creativity, critical thinking, problem solving, teamwork, and communication skills into their curricula. The fact that several universities have been part of international programmes with foreign universities has also helped to diffuse best-practices regarding these issues. However, entrepreneurship training or intellectual property teaching are still absent from the great majority of institutions, including engineering schools. The supply of new graduates is still concentrated on humanities and social sciences, with the relative part of natural sciences and engineering below the EU average.

2.3 Knowledge demand
The structural composition of the economy has suffered important changes over the most recent decades. A joint VW-Ford investment to build a large car manufacturing plant in 1991 induced a progression of the specialization from low- to medium-tech industries (Godinho and Mamede, 2004). Further, the increasing urbanization and general economic development has led to a dominance of services that is now in line with what is typical of the most developed economies, with a consolidation of a KIBS segment supplying advanced services As highlighted above, however, over recent years the structure that emerged in the 1990s has not undergone further changes, as
incoming FDI slowed down and the domestic larger firms have not sought to position themselves in higher tech- and knowledge-intensive activities. This structural stickiness will certainly be aggravated by the recession and the prevailing business mentality. This situation reflects itself in a climate of weak knowledge demand for universities’ research. The incapacity of the business sector defining a clear agenda for what contributions it might seek from the research sector, which with a few exceptions has characterized the national innovation system so far, will therefore remain, at least in the short term.

In recent years there has been a change in the distribution of GBAORD according to socio-economic objectives, with a reduction of the share of general university funds and a rise in the share of socio-economic objectives related to economic and social applications. Even so, the general university funds together with non-oriented funds still dominated the GBAORD socio-economic objectives by 2006, with a 48% share. The next most important socio-economic objective relates to productivity and industrial technologies, with a 17% share. This, together with applications to infrastructures, energy, environment and agriculture, which might also be considered as objectives more directly related to economic applications add up to 37% of the GBAORD. The more social objectives, which include health and other social applications, have a joint share of 11%. Finally, and in contrast to several other EU member states, the share of the GBAORD dedicated to defence and space is residual, at less than 1% of the total (Eurostat, 2009).

2.4 Knowledge production

The production of scientific and technological knowledge is the core function that a research system must fulfil. While different aspects may be included in the analysis of this function, the assessment provided in this section focuses on the following dimensions: quality of the knowledge production, the exploitability of the knowledge creation and policy measures aiming to improve the knowledge creation.

2.4.1 Quality and excellence of knowledge production

Since 1995 there has been a strong and sustained commitment to increase both the size and the quality of the research performed in Portugal. There has been a policy of providing support for research units based on the quality of research output, assessed by international evaluation. The policy of promoting post-graduate education has also played an important role in increasing the supply of human resources. This led to a significant growth of both the input and the scientific output of the research system (GPEARI, 2010a). In recent years, Portugal has attracted foreign researchers: as a well-known Portuguese researcher mentioned in a recent press interview, “almost 50% of the 1,200 researchers recruited in the last two years (...) are foreign”². Two important research infrastructures, one publicly- and the other privately-owned, were recently launched: the Iberian International Nanotechnology Laboratory (INL), a Portuguese-Spanish joint-venture focussed on nanosciences and nanotechnologies research; and the Champalimaud Research Centre, inaugurated on October 5, 2010, which focuses on translational medical research on cancer and neurosciences.

² Nuno Ferrand de Almeida, ‘Nunca se olha para o outro país que existe’, Público, 5 November, 2010.
A long and fruitful way has been pursued to strengthen research activities in Portugal. The downside, however, is knowledge exploitability. Science policy has been just concerned with increasing the human resource stock and improving research quality and scientific performance, the exploitability of knowledge production being a rather secondary concern.

The sustained commitment with expanding the input for the research system is shown by the data provided by GPEARI: total R&D expenditure reached 1.7% of GDP in 2009; the business sector accounted for 47% of total; full time equivalent (FTE) researchers more than doubled in 6 years, reaching 8.2 per thousand in 2009, with a very high share of women (44%); the number S&T graduates as a share of the population in the 20-29 years cohort increased from 1.2% to 2.1% from 2005 to 2008; and the annual number of new PhDs has steadily increased, from 1027 for 2003 to 1496 for 2008 with the share of new PhD holders in the sciences and engineering fields reaching 0.45 per 1,000 individuals in the 25-34 years age cohort.

The effort reported above has been translated into a significant improvement in the research output. With regard to scientific publications, data released by GPEARI indicates that the number of ISI publications per million inhabitants for 2008 reached 626, an increase of 68% as against 2004. Though partly due to the low starting basis, the growth is remarkable, leading the indicator for Portugal to correspond to 72% of the EU average in 2008, compared to 52% in 2004. The information disclosed by GPEARI (2010a) on impact indicators, is scarce. In general, impact levels increased from 1998-2002 to 2003-2007. The fields where Portugal’s scientific production impact indicators exceed the EU average are space sciences, clinical medicine, physics, and agricultural sciences. Patent statistics indicate a significant growth in international patenting. Between 2004 and 2008, the number of USPTO filings experienced a 2.8-fold increase), while between 2004 and 2009 the EPO filings recorded a two-fold increase. In spite of this growth, patents continue to be the weak link of Portugal’s research output, as total filings in the USPTO and EPO are both still below 100 in 2008. This situation reflects the insufficient concern with exploitability. As pointed out in the previous Country Report (Godinho & Simões, 2009), there has been an implicit assumption that the effort in the provision of highly skilled human resources and in encouraging research quality and internationalization would, sooner or later, lead to changing the economic fabric. However, this idea has not materialized. Exploitability of research outputs is very limited. It may even be argued that the focus on international research standards led to an increased gap between the scientific and the business worlds. This issue will be dealt with more in detail in the section on knowledge circulation.

2.4.2 Policy aiming at improving the quality and excellence of knowledge production

There is a clear and sustained concern with ensuring quality and excellence of the research system. The 2006 policy document ‘Commitment to Science for the Future of Portugal’ (hereinafter ‘Commitment to Science’) identified “internationalization, [...] exigency and [...] evaluation” as key tenets of Portugal’s S&T policy.

Political drive was paramount in the process developed since 1995. In fact, between 1995 and 2010, with a short interval of two years (2002-2004), Mr. Mariano Gago has served as Minister for S&T (with a wider portfolio since 2005, when the Ministry included Higher Education as well). This has ensured a long-term consistency in pursuing the above mentioned goals. The successive Community Support
Frameworks (CSFs) and the present NSRF 2007-2013 have been essential in providing the funds to entice research organisations to engage in behavioural change. FCT, which plays a Research Council role, has managed the funding of academic research, while ensuring the research evaluation function. The above mentioned concern has gone hand to hand with the promotion of research internationalization as a strategic priority.

A wide-reaching process of evaluation of Research Units was launched in the second half of the 1990s. This provided Research Units with three-year funding, enabling them to define longer-term strategies, not dependent on specific project financing. Further evaluations have meanwhile been carried out, being the results of the most recent one (2007) available on the FCT website. A similar process is under way for the Associated Laboratories (ALs). The legal frame for the creation of ALs provides that the granting of this label, which entails the provision of long-term financing, is based on an evaluation of the candidate organisation capabilities, past performance, and capacity to cooperate in the achievement of the goals of scientific and technological policy. The first ALs were created in 2000, there are now 25 in a wide range of scientific fields. There has been a move towards the merging of some ALs, in order to achieve economies of scale as well as to strengthen their attractiveness for skilled foreign researchers. The most relevant initiative in this regard was the creation of I3S, the Health Research and Innovation Institute, corresponding to the merger of IPATIMUP (the institute for molecular pathology and immunology), IBMC (the institute for cellular and molecular biology) and INEB (the institute for biomedical engineering). The present round of international evaluation of ALs was launched in 2008, and concerns activities carried out between 2003 and 2007 and its results are expected to be disclosed soon.

The internationalization of the research system is a significant policy concern. Though the public funding mechanisms do not make transnational cooperation compulsory, the quality and depth of such cooperation are well regarded.

### 2.5 Knowledge circulation

Tackling the challenges that European society faces in the 21st century will require a multi-disciplinary approach and coordinated efforts. Many debates and conferences, e.g. the Lund Declaration, recognise that such complex issues cannot be solved by single institutions, technology sectors or MS acting alone. Hence strong interactions within the "knowledge triangle" (education, research and innovation) should be promoted at all levels. Moreover, in the context of increasing globalisation, cross-border flows of knowledge are becoming increasingly important. This section provides an assessment of the actions at national level aiming to allow an efficient flow of knowledge between different R&D actors and across borders.

#### 2.5.1 Knowledge circulation between the universities, PROs and business sectors

Policy headlines concerning knowledge circulation between the universities, Public Research Organisations (PROs) and the business sector did not undergo significant changes since the last report (Godinho & Simões, 2009). There is a political commitment to strengthen the relationships between Universities, research organisations and companies. This is expressed in different measures under the Compete’ programme pointed out in 2.2.2 above. Effort towards increasing...
Portuguese involvement in the 7th Framework Programme (FP7) has been pursued by GPPQ, the office in charge of promoting Portuguese participation in FP7.

The main change on this regard was the publication of the reviewed university teaching career statute in 2009. The former version of the statute had no explicit incentives to University-Industry collaboration. The preamble of reviewed statute indicates “the creation of conditions for the cooperation between universities and other organisations” as an important reason for the reform undertaken. In the new framework university teachers may be freed from their university duties, for specified periods, to carry out extension services or research projects outside their university. However, the change did not go so far on this regard as anticipated. The creation of effective conditions for cooperation will very much depend on the evaluation criteria currently being defined by each University. The expectation that the reformed statute would provide a strong impulse towards university-industry cooperation may not materialize, as incentives for conventional academic performance remain dominant.

Important initiatives, taken in earlier rounds of Structural Funds to stimulate transfer activities form the universities, concerned the creation of TTOs (called OTICs - Knowledge and Technology Transfer Offices) in the main Universities and Polytechnics, and TLOs (GAPIs - Industrial Property Support Offices). Nowadays the support provided to these organisations was discontinued. While some were able to forge their own way ahead, others were not able to survive. In some cases OTICs and GAPIs merged, giving rise to what was called GAPI 2.0. UTEN, the University Industry Enterprise Network, created in 2008, includes the TTOs of the main Portuguese Universities and research organisations. A closer link was recently established between UTEN and the Universities, the Council of Rectors becoming involved in the following up of UTEN’s activities.

The ‘Compete’ programme, which is part of the NSRF 2007-2013, includes several of measures aimed at fostering knowledge circulation, which were mentioned above. The main conclusions of the recent mid-term evaluation of the 2007-2013 NSRF (IESE/Quaternaire Portugal, 2010) on this regard suggest the existence of a trend towards an increased commitment of companies to invest in R&D, with 74 projects aimed at the creation of R&D teams. This is in line with the overall R&D statistics and may be interpreted as indicating that the creation of in-house anchors enables the development of R&D cooperation initiatives. The number of RTD vouchers is somewhat below expectations, having in mind the simplification of the incentive assignment process. The report suggests that this may be a consequence of the insufficient capacity of the S&T organisations, namely University R&D units, in other regions to provide services to firms.

The creation of the Competitiveness and Technology Poles (CTPs) and other clusters was the most innovative and wide ranging measure under the NSRF’s ‘Compete’ programme. CTPs are expected to provide a shared context enabling cooperation between R&D organisations, companies and other players in order to develop, share and apply knowledge to enhance the country’s competitiveness. After a long process of building up the clusters, they underwent a selection procedure. The evaluation led to the selection of 11 CTPs. Since two years only have elapsed since the creation of the CTPs it is probably too early for a sound assessment of their activities. Anecdotal information suggests that so far a significant variance exists in their performance.

AdI, the Innovation Agency, continues to manage the brokerage initiative Technology Supply and Demand Marketplace. This is aimed at matching knowledge supply and
demand. It is supplemented by brokerage events, often in connection with European brokerage initiatives. According to the information disclosed by AdI (AdI, 2009) supply exceeds demand by large. The results so far appear to be limited.

A reference is due to the organisation of events aimed at promoting the interaction between research organisations and companies, while using the results from cooperative endeavours for demonstration purposes. An example of this effort is the ‘Portugal Tecnológico’ (Technological Portugal) exhibition held in September 2010.

2.5.2 Cross-border knowledge circulation

Portugal is a small open economy for which cross-border knowledge circulation has historically been essential to foster development and competitiveness. Foreign direct investment has played a key role in the modernization of Portugal’s economic fabric. Moreover, as mentioned above, internationalization has been one of the key tenets of Portugal’s S&T policy, fostering international cooperation and the inward and outward movement of researchers.

‘Partnerships for the Future’ was a very relevant international cooperation initiative, through agreements with several US Universities. As mentioned in previous reports, this cooperation with US Universities, including with the MIT, Carnegie-Mellon, the University of Texas at Austin and Harvard Medical School, was a central feature of the ‘Commitment to Science’ policy roadmap (for further details see Godinho & Simões, 2009). These partnerships address several areas which have been identified in the EU as having European value added, namely health, ICT, energy, environment, transport and socio-economic sciences. So far the MIT Portugal Programme has financed 20 research projects, and involved more than 300 doctoral students. The International Collaboratory for Emerging Technologies (CoLab), created in the context of the partnership with the University of Texas at Austin, organised a conference to diffuse the results achieved by this partnership. With regard to the cooperation with Carnegie-Mellon, three new thematic research networks were launched, respectively: new products and services for the Internet of the future; critical infrastructures security and protection; and interactive media technologies. Still under the ‘Partnerships for the Future’ initiative, a cooperation programme was set up as a joint initiative of FCT, UMIC and Fraunhofer-Gesellschaft. In contrast with the former partnerships, this one was established with an organisation from another European Research Area country, and it focuses exclusively on research activities.

An important initiative in one of the areas with European value added (nanosciences and nanotechnologies) was the creation of the INL – International Iberian Nanotechnology Laboratory, located in Braga. INL “…is the first, fully international research organisation in Europe in the field of nanoscience and nanotechnology. It has an international legal framework similar to intergovernmental laboratories in other areas located in Europe like CERN, ESO, EMBL, and ESRF. The new laboratory is being established by Portugal and Spain, but in the future it will be open to the membership of other countries of Europe and other regions of the world”3. Though slightly behind schedule, the INL setting up procedure has been pursued. INL hosted in September 2010 an International conference on ‘Trends in nanotechnology’

As mentioned in the previous Country Report, GPPQ, the office for encouraging Portuguese participation in FP7, was launched in 2007. GPPQ disclosed information

---

3 Quoted from http://www.iinl.org/nano-history.php, assessed on 11 November 2010
on the Portuguese participation in FP7. Between 2007 and 2009, Portuguese organisations participated in around 500 projects in the Capacities and Cooperation Programmes (those which require transnational consortia applications), with a leadership role in 10% of them. Portugal’s success rate is slightly above average (17.6 versus 15.9%). From the business side, concerns were expressed with an excessive bureaucratization of the application and selection procedure for SMEs to participate in FP7. COTEC Portugal, the business association for innovation, together with COTEC Italy and COTEC Spain, has raised some criticisms on this regard.

Portugal is actively supporting cross-border cooperation in several areas with European value added. For instance, the calls for the creation of thematic research consortia in Portugal concern S&T fields which are very close to these areas: biosciences and biotechnology; physics and advanced computation; public risks; oceanography; space; and security.

As it will be analysed in more detail below, there is a policy aimed at encouraging international mobility of researchers. Looking from Portugal’s perspective, both inward and outward researchers’ mobility is taking place. The decision to create 1,000 research positions, aimed at countering the outward movement of Portuguese scientists, had another important consequence: to open the Portuguese research market to foreign citizens, either European or not. As indicated in 2.4.1, more than 40% of the recruited researchers are foreign. Combined with the previous international drive of Portuguese research organisations, this is leading to a quantum leap in the internationalization of the Portuguese research system.

2.5.3 Main societal challenges

The Portuguese S&T policy during the last 15 years may be characterized as a horizontal, broad spectrum policy. Although there are signs of change, which are evident for instance in the bet on nanotechnologies, with the creation of INL, in the priorities defined for cooperative projects under the ‘Partnerships for the Future of Portugal’, and in thematic research networks, the policy is still too generic. Having said this, it is possible to find several areas of convergence between Portuguese S&T policy, as expressed in the 2006 ‘Commitment to Science’, and the “grand challenges” identified by the Lund Declaration. In fact, the ‘Commitment to Science’ identified the launching of public policies to support R&D projects as an important vector of S&T policy. The issues raised overlap, to some extent, with the Lund Declaration: natural and environmental risks (which include global warming); pandemics and public health; and social transformations (including ageing societies). Area-specific initiatives in the context of the ‘Partnerships for the Future of Portugal’ and thematic research consortia deal with energy or security.

To sum up, it may be said that the Lund Declaration did not directly influenced Portugal’s R&D policy priorities. These have remained the same as indicated in the ‘Commitment to Science’ initiative. However, the alignment of the priorities defined earlier with the “grand challenges” identified in Lund is evident.

2.6 Overall assessment

This section is aimed at assessing the extent to which recent policy changes effectively address the identified system weaknesses and contribute to leverage the strengths. The analysis is based on the review of resource mobilization, knowledge
demand, knowledge production and knowledge circulation undertaken above, and is summarized in Table 1. It will be complemented with the identification of barriers to R&D investments and the respective opportunities and risks portrayed in Table 2.

The most significant policy opportunities arise from the NSRF programmes whose implementation reached cruising speed. Such programmes contribute to funding of new R&D activities of considerable size and may help to keep Portuguese GERD/GDP ratio above 1% over the near future. The NSRF funds represent an opportunity for new approaches regarding stakeholders’ coordination, clustering and promotion of the systemic relationships which so far have been by and large neglected. The CTPs are aimed at facilitating the communication and coordination between knowledge demand and supply. The research consortia now being set up between the government labs and other actors may work in a similar direction. The new university law offers the possibility that research units have a more active say in managing universities’ activities. However, the reviewed university career statute did not introduce incentives to stimulate university-industry collaboration as expected.

The main policy risks are similar to those identified in the 2009 country report (Godinho & Simões, 2009). The first one is related with the general current economic and financial climate, which deepening and lengthening of the economic crisis may jeopardise the GERD growth recorded in recent years. Business firms might feel tempted to cut back their R&D investments if they do not perceive an economic upturn in the short to medium term. The decline in profits will make firms less prone to use the SIFIDE (the R&D incentives system), affecting their willingness to report R&D expenditures. The second risk has to do with a structural aspect: the lack of systemic integration between the research and innovation stakeholders. There is the possibility that the private business sector, public procurement and civil society organisations will not mature rapidly enough in terms of the capability to influence the country’s research agenda. This situation may lead to a widening gap between knowledge production and knowledge circulation.

Table 1: Summary of main policy related opportunities and risks

<table>
<thead>
<tr>
<th>Domain</th>
<th>Main policy opportunities</th>
<th>Main policy-related risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource mobilisation</td>
<td>Government commitment and the resources of the NSRF 2007-2013, might help to keep public financing of research stable in spite of budgetary restraints. The creation of two relevant research centres (INL and the Champallimaud Centre) is likely to provide a new impetus for resource mobilization.</td>
<td>If recession lengthens BERD might incur a severe drop. The lack of generalised consensus about research investment might jeopardise current priorities if political change occurs. Further competitive funding increase and the difficulty in providing stable jobs may negatively impact on the sustainability of the research system.</td>
</tr>
<tr>
<td>Knowledge demand</td>
<td>Cluster-based policies were launched in the context of NSRF 2007-2013, with a view to pave the way for a wider coordination between knowledge supply and demand.</td>
<td>The focus on academic excellence might widen the gap between research and societal aims. The persistence of public investment in conventional infrastructure projects is not in line with the idea of using public procurement as a technology lever. The performance of existing CTPs appears to be diversified, raising the risk of failed initiatives.</td>
</tr>
</tbody>
</table>
Government efforts to keep research funding in spite of the crisis are likely to consolidate academic knowledge production and sustain publication growth. The reform of university teachers' statute may provide a stimulus to university-industry links. In relation to exploitability there is a large scope for improvement. The development of CTPs policies and the establishment of research consortia led by government labs may stimulate such development.

The public policy persistence on a linear model approach does not help integrated, systemic development. The absence of clear S&T and research policy priorities and the seemingly lack of commitment to make participatory structures work may limit the convergence of perspectives needed to improve exploitability.

Besides the points mentioned above, the commitment to promote company R&D units is expected to provide opportunities for knowledge sharing. There are cases where the launching of innovation and R&D vouchers has enticed a demand for research services. There is a broad range of measures that could still contribute to research cooperation and knowledge circulation.

The insufficient stimulus of long term cooperation between different stakeholders, together with the inactivity of policy advisory mechanisms, may not facilitate the development of consensus and the dissemination of knowledge. The low concern with exploitability of knowledge may have negative impact on university-industry dialogue and therefore on knowledge circulation.

From the analysis above it is possible to derive five main barriers to increasing private R&D investments. The first is the economic structure itself, as supplier-dominated industries still play an important role while the number of technology-based companies is still limited (Mamede et al. 2010). The second has to do with business firms size distribution, as on average firms have a small size and large R&D performing companies are scarce. Furthermore, the linkages between large firms and small high tech, innovative firms are weak, as recent research on COTEC’s Innovative SMEs Network has shown (Simões et al, 2010). Third, the absorptive capabilities of most SMEs are weak. The fourth barrier has to do with the geographic distance to larger and demanding markets. This problem is compounded by the weakness of domestic linkages among business and research centres (Godinho & Simões, 2005). In spite of a host of measures to promote such linkages, there is still a gap to be bridged. Finally, Portugal still lacks a dynamic, professional private venture and risk capital industry endowed with suitable managerial and international marketing capabilities to foster the international development of knowledge intensive spin-off firms.

As mentioned in the previous report (Godinho & Simões, 2009), the weakest features of the policy mix continue to be the fragility in the promotion of high-tech start-ups and the attraction of FDI. The former depends more on institutional features that are not properly tackled by current policies. The latter depends more on factors such as strategic intelligence and professionalism, although financial incentives do play a role. The achievement of the “collective efficiency strategies” (clustering) is likely to be critical for the future strengthening of university-industry cooperation. A final shortcoming concerns the absence of proper instruments for participation and consensus building among the main stakeholders in relation to long term priorities.

To promote private investment in research there are important opportunities related to the possibility of attracting sophisticated FDI, stimulating knowledge-intensive start ups and developing company in-house capabilities. There are, however, important
risks related to the economic and financial crisis and the economic and budgetary constraints that Portugal is facing.

**Table 2: Main barriers to R&D investments and respective policy opportunities and risks**

<table>
<thead>
<tr>
<th>Barriers to R&amp;D investment</th>
<th>Opportunities and Risks generated by the policy mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics of the economic fabric</td>
<td>Efforts are needed in: entrepreneurship, FDI attraction, and company in-house capabilities. Risks relate to: contextual factors (namely the challenges of financing the Portuguese economy and the slowing-down of Europe); and the inability to mobilise human potential and attract investments.</td>
</tr>
<tr>
<td>Shortage of large R&amp;D performers</td>
<td>The new policy mix and other initiatives shall be used to foster a stronger R&amp;D commitment by players with a ‘pulling’ effect. Weak linkages between large companies and knowledge intensive SMEs are a problem, but this raises opportunities for increased collaboration.</td>
</tr>
<tr>
<td>Low demanding customers</td>
<td>Opportunities related to: the openness of the economy; ICT use; and new approaches to clustering. The risks stem from recession that limits the possibility of innovative firms accessing demanding international customers.</td>
</tr>
<tr>
<td>Weak absorptive capacity of many SMEs</td>
<td>The pursuit of clustering policies, together with the new measures to promote R&amp;D and innovation (namely R&amp;D centres and teams as well as R&amp;D and innovation vouchers), may open opportunities, but there is a risk that unsuccessful implementation may jeopardise the efforts</td>
</tr>
<tr>
<td>Weakness of venture capital institutions</td>
<td>This structural problem may justify foreign investment to provide not just financing but especially the complementary managerial capabilities needed.</td>
</tr>
<tr>
<td>Public research policy with insufficient application concerns</td>
<td>The main risks related to this are the development of a good but self-centered research system without strong links with economic and social needs, although the launch of PCTs might, if properly managed, contribute to generate collaborative opportunities.</td>
</tr>
</tbody>
</table>

3 **Interactions between national policies and the European Research Area**

3.1 **Towards a European labour market for researchers**

The Communication Better careers and more mobility: A European Partnership for Researchers proposed by EC in May 2008 aims to accelerate progress in four key areas:

- Open recruitment and portability of grants;
- Meeting the social security and supplementary pension needs of mobile researchers;
- Providing attractive employment and working conditions;
- Enhancing the training, skills and experience of researchers

The Commission has also launched concrete initiatives, such as dedicated information services for researchers, in particular through the activities grouped under the name of EURAXESS – Researchers in Motion. Based on the assessment of the national situation in the four key dimensions detailed above, this section will conclude if national policy efforts are supporting a balanced ‘brain circulation’, with
outward mobility levels matching inward mobility levels. High levels of outward mobility coupled with low levels of inward mobility often signal an unattractive national labour market for researchers and unsuitable research infrastructures. This may trigger, despite the policy efforts supporting the mobility the ‘brain drain’ rather than brain circulation.

3.1.1 Stocks and mobility flows of researchers

The average annual number of new PhDs awarded or recognised by Portuguese Universities rose from below 80 in the 1970s, to more than 200 in the 1980s and to over 500 in 1995, eventually reaching 1000 by 2003. The most recent figures showed that 1459 new PhDs were awarded or recognised in Portugal in 2007. Further to this growing supply of PhDs, the number of new holders of higher education degrees has steadily increased. In 2007 9.6% of Portuguese residents (7.8% of men and 11.3% of women) held a higher education degree. If only the population of active age (15-64 years old) is taken, this rate rises to 13.1% in 2007, while it was 11.2% in 2004 (Godinho & Simões, 2009).

This growth in the supply of individuals holding higher education (HE) degrees has however been reflected in a rising unemployment rate among educated people. About 38,000 holders of HE degrees were registered in the Employment Centres in December 2008, equivalent to a 4.1% unemployment rate for this segment of the labour market (Godinho & Simões, 2009). For holders of Masters or PhD degrees, according to official statistics the total unemployment figures in December 2008 were, respectively, 809 and 62. These figures do not fully convey the difficulty in finding a job in Portugal for this group of people, since a number of them have decided to go abroad to follow their careers. This is a new phenomenon in Portugal. The traditional situation was that any new PhD degree holder would automatically find a position.

There is an increasing tension in the labour market for holders of advanced degrees despite a steady growth in the number of employed researchers. In 1982 there were 5,736 researchers (3,963 FTE), equivalent to 0.9‰ of the active population, but by 2008 the figure rose to 87,565 (47,882 FTE) or 8.6 ‰ of the active population. This huge increase in less than 3 decades has been accompanied by an increasing difficulty in absorbing entrants to the research labour market.

Traditionally, new researchers entering this market have been employed by public universities or the government laboratories. The situation was that the newcomers had relatively stable career prospects, at least after being granted tenure. This situation has, however, been changing fast recently. Many institutions now have harder tenure granting procedures and the recruitment of new researchers, even for replacement purposes, is much more difficult due to budgetary pressures or legal restrictions. In this context, institutions have been able to absorb some “fresh blood” by contracting younger researchers for non-permanent positions, by using Post-Doc grants which provide support from three up to six years.

The Ciencia2008 initiative helped in establishing 1,000 new Post-Doc positions in the research units supported by the FCT. These positions are expected to last up to 5 years, over which those benefiting from them enjoy salary conditions equivalent to young PhDs entering the research or university careers.

There are no statistics or systematic studies regarding transnational flows of researchers from and into Portugal. The only solid evidence on incoming mobility has
to do with the research grants awarded by FCT for Doctoral and Post-Doc positions. In the decade between 2000 and 2009, 34% of Post-Doc grants were awarded to foreigners, while for doctoral research the situation over most of the decade was that a fraction below 10% of the grants was awarded to foreigners. This situation has however changed swiftly in 2008 and 2009, with foreign participation in PhD grants getting respectively to 13% and 18%. Of the Post-Doc positions offered under the Ciencia2007 and Ciencia2008 initiatives, 42% were awarded to foreign nationals. The perception that exists is that this large influx of foreigners relates only to junior positions of the research system, while the senior positions remain so far almost entirely in the hands of Portuguese nationals. Such recent changes may however have long term impacts in an increasing internationalization of the domestic research labour market.

3.1.2 Providing attractive employment and working conditions

University and research careers have had a certain parallel in Portugal. After being granted a PhD an individual entering those careers can be promoted to three successive positions up to Full Professor (or Research Coordinator in the research career). The salaries for both careers are similar. In 2010 they started from a gross monthly salary of €3,192 (for an Assistant Professor) up to €5,402 (for the most senior position). These figures compare favourably with the salaries of university degrees holders in the Public Service. However, the 2011 government budget has imposed severe cuts in salaries of public servants including those who work in the national labs and public universities, starting at 3.5% for a salary of €1,550 up to 10% for salaries above €4,200. These cuts happened already in the sequence of a generalized salary freeze put in place in 2010.

A study on the remuneration of researchers in the public and private sectors carried out for the Research Directorate-General of the European Commission⁴ showed that Portuguese researchers are in the medium-low range in terms of remuneration level in the EU25. Referring to year 2006 the average yearly remuneration paid in Portugal was €33,334 (in PPP), below the EU25 average which was €40,126. The Portuguese position in the overall ranking seems to be negatively affected by the substantial number of fellowships currently awarded in the country. According to that study, when level of experience is considered Portugal is among the group of countries with lowest salaries paid in the EU25 to non-experienced researchers (0-4 years). Researchers in this group have a yearly remuneration of €9,644, which is less than half of the EU average. This gap narrows dramatically as experience increases, with most researchers with more than 15 years of experience earning €54,496, close to the EU25 average of €55,213.

PhD and Post-Doc grants are typically supported by the FCT. For 2010 the monthly stipend of a PhD grant awarded is €980 in Portugal and €1,710 abroad, while post-doc grants are, respectively, €1,495 and €2,245.

Specific funds are available to allow universities and research labs to attract foreign scientists. Also a few private firms are following active policies to attract foreign researchers. However, the absorption of researchers by the private business sector is still very limited in overall terms. This means that competition based on higher salaries offered by companies to researchers has not yet affected universities and research labs.

---

⁴ 2007 EC report "Remuneration of Researchers in the Public and Private sectors"
The reviewed statute of the universities’ teachers career intends to promote a relative flattening of the academic pyramid, by imposing that at least 50% of the tenured staff at universities should be composed of associate and full professors. The prevailing budgetary conditions might however jeopardise such endeavour, at least in the medium-term.

While a national policy for the research labour market has started to emerge in the most recent years, the European Charter of Researchers has not been a central issue. It is unsurprising that according to the EURAXESS site only 4 Portuguese organisations have signed the European Researchers’ Charter.

In relation to the gender gap, the latest data suggest that it is narrowing. Women made up 41% of all HE lecturers and professors in 2001 and 43% in 2007. In the research sector the equivalent proportion was 44% in 2006, in contrast with a EU27 average of only 28%. Nonetheless, in the associate laboratories, only 4 (out of 25) have women as directors. Further, the number of women promoted to full professorships in the universities is still below their share in total faculty. Portuguese law guarantees a four month maternity leave for women with full pay. Scholarships follow the same rule, as they are paid over the leave and extended for the same duration. Women cannot be fired during pregnancy and their return to the same type of work is guaranteed by law.

### 3.1.3 Open recruitment and portability of grants

The reviewed statute of the university teachers’ career imposes open international competitions for the positions in the academic career. It has also eliminated the requisite that to compete for the senior positions applicants had to have at least 3 years of experience in the previous position. This change allows for individuals holding appropriate CVs to compete directly to senior positions, while at the same time allows for those who have had no previous experience in teaching to compete, thus facilitating those who have worked abroad to compete. As the competitions for positions are based on the evaluation of written CVs, this means that at least in principle there are not too many barriers to incoming researchers. However, it shall be pointed out that most universities’ programmes, even at the doctorate level, are taught in Portuguese.

In May 2008 it was launched the Invited Chairs programme, which aims to attract international high level researchers to stimulate the internationalization of Portuguese universities. The programme offered up to 50 Full Professorship posts in 2008 and 2009. FCT provides up to 25% to 50% of the salary to facilitate the attraction of international leading researchers for between three to five years (renewable once).

In relation to the access to grants offered by the Portuguese government, the situation is somewhat different. The number of grants available for PhD training has been rising since the early 1970s. As the supply of new researchers holding a PhD degree has grown significantly, there has been, since the middle of the 1990s, a complementary incentive to more senior researchers, with the awarding of post-doc grants and other scholarships for senior positions. The institution that has administered the bulk of these different sorts of grants has been FCT.

The grants awarded by FCT are intended primarily for Portuguese nationals and can be used either in Portugal or abroad. Mobility is explicitly valued, namely in the case of the national researchers with foreign doctoral degrees who wish to return to Portugal. The larger national universities host Mobility Centres intended to assist
incoming researchers to move in. These Mobility Centres are members of the European Network of Mobility Centres ERA-MORE.

The grants awarded by FCT have been addressed to foreign researchers wishing to perform their research in Portuguese Universities, whether they are nationals from other EU countries or from third countries. Of the 1,000 post-doc positions offered in the sequence of the Ciencia2008 initiative, which were conceived to last up to 5 years each, more than 40% of those new positions have been taken by foreign nationals. However, the most recent regulation, issued in July 2010, imposes that a foreign national may only be entitled to compete for the offered grants in case she or he holds a permanent residence visa, which is not possible to be granted before a 5-year period of temporary residence. It shall nevertheless be pointed out that the 5-year requisite might be waived in the case the grant is to participate in a programme part of international agreements or partnerships of which the Portuguese government is signatory.

The individual grants awarded for following PhD programmes or for post doc research might support training and work abroad. This has been an usual circumstance over the most recent decades. However, grants awarded to research projects, have no provisions regarding their possible portability abroad. Further the expectation is that only Portuguese-registered entities may apply for this sort of research funding. The above mentioned waiving clause regarding international agreements or partnerships also applies here.

As the research community has grown significantly, new instruments have been developed for its management. The DeGóis Curricula Platform is a tool developed for FCT for gathering, supplying and analysing the production of Portuguese researchers who have been invited to upload their CVs in the Platform. This facilitates the potential international mobility of researchers.

Another initiative, already mentioned, which necessarily involves transnational mobility is the INL – International Iberian Nanotechnology Laboratory.

The Portuguese Internet site of the European Researchers’ Mobility Portal, has a very intense use. By November 2010, the site boasted more than 1.1 million visits since its inception in June 2006. Overall 810 organisations registered on this portal, which given the size of the country and the research community might be seen has a significant sign of success of the site.

3.1.4 Meeting the social security and supplementary pension needs of mobile researchers

Foreign researchers who work and reside legally in Portugal, along with their families, are subject to the same rights and obligations as Portuguese nationals, regardless they are from the EU or form third countries. They need to be enrolled in the social security registry, paying the same contributions and benefiting from the same benefits as Portuguese workers performing equivalent duties. The tax situation is similar to social security, as foreign researchers have the same duties as nationals.

Specific provisions have been made in the 2007 Immigration Law in order to facilitate the entry of highly qualified foreigners, regarding both temporary and residence visas. This law was designed taking into consideration the attraction of foreign researchers to Portugal, by facilitating temporary and residence scientific visas. Research centres, universities or firms seeking to employ scientists send visa requests directly to the MCTES and visas have now to be conceded within 30 days.
These special visas are awarded to foreign nationals of third countries who intend to come to Portugal to carry out research or a teaching activity, provided that they have been selected to work in a higher education institution, a research centre or a company duly recognized by the MCTES.

3.1.5 Enhancing the training, skills and experience of European researchers

An area that has been significantly stimulated by the Portuguese government in recent years, and which is directly related to mobility prospects and activities, is the direct relationship with top foreign universities and research organisations, labelled by the Government as ‘Partnerships for the Future’. The contracts with MIT, Carnegie-Mellon and University of Texas (which led to the MIT-Portugal, CMU-Portugal and UT Austin Portugal programmes) are part of this initiative.

The Postgraduate and PhD courses in the framework of these three programmes are taught in English. Initially they were offered to the same target population as that addressed by the FCT grants, but they have recently been opened to students from all over the world. These programmes typically involve a component, which is taught in Portugal, although PhD students are also expected to conduct part of their research in the American universities.

Also in the context of the ‘Partnerships for the Future’ initiative, the Fraunhofer Portugal programme was established as a joint initiative of FCT, UMIC and Fraunhofer-Gesellschaft. In contrast with the former contracts, this one was established with an organisation from another European Research Area country and focuses exclusively on research activities.

With regard to the Bologna process Portugal has adhered to the aim of contributing to the creation of a European Higher Education Area, namely by reinforcing the three cycle system (bachelor/master/doctorate). By 2007, about 70% of all university courses in Portugal were already following the ECTS scheme, and 88% of the 1st and 2nd cycle courses were expected to work according to Bologna rules in academic year 2007/8. As recently as April 2008, the overall rate of accomplishment of the adjustments recommended by the Bologna process was estimated by the Portuguese Government to be 90%.

3.2 Research infrastructures

Research infrastructures (RIs) are a key instrument in the creation of new knowledge and, by implication, innovation, in bringing together a wide diversity of stakeholders, helping to create a new research environment in which researchers have shared access to scientific facilities. Recently, most EU countries have begun to identify their future national RI needs, budgets and priorities in the so called National Roadmaps for Research Infrastructures. These strategic documents also set out a strategic view on how to guarantee and maintain access to research facilities. Although some countries invest heavily in RIs, none can provide all the required state-of-the-art facilities on a national basis. Several large RIs have already been created in Europe. While optimising the use and development of existing RIs remains important, new infrastructures are needed to respond to the latest research needs and challenges. European Strategic Forum for Research Infrastructures (ESFRI) was established in April 2002 to support a coherent approach to policy-making on RIs in Europe and to act as an incubator for international negotiations on concrete
This section assesses the research infrastructures national landscape, focusing on the national RI roadmap and national participation in ESFRI.

3.2.1 National Research Infrastructures roadmap

To understand recent developments regarding RIs in Portugal, a brief background of the national RI context and strategy is needed.

Since the late 1980s there has been an effort to create and upgrade RIs with the support of the Structural Funds. In 2001, a specific public Programme for the Renewal of Scientific Equipment (PNRC) was launched. It involved a financial envelope of €91.6m and the creation of six National Networks. Since then, there has been no other broad scale programme. Research institutions have applied to existing support programmes to renew and upgrade their scientific equipment.

Three relevant research infrastructures were created since 2000: Biblioteca do Conhecimento Online (On-line Knowledge Library, b-on), Rede de Ciência, Tecnologia e Ensino Superior - RCTS (S&T and HE Education Network) and the Portuguese National GRID Initiative. More than 40,000 professors and researchers and 340,000 students from 66 research and higher education institutions now have access to the b-on contents and search engine, which also provides access to the Web of Knowledge bibliographic reference and citation tools. There are, however, indications that due to budgetary restrictions the government is planning intending to pass the financial burden of this access to universities and research organisations. This has generated a reaction by the research community, with a public appeal circulating in the web. RCTS is a computing network, run by FCCN, which makes use of Internet protocols to provide a collaboration and communication platform among educational, scientific, technological and cultural institutions. The GRID Initiative, launched in 2006, is aimed at encouraging the development of GRID Computing and the sharing of distributed computing resources. Other national RIs include those associated to the National Laboratory for Civil Engineering (LNEC) on building, to the Gulbenkian Institute for Science (IGC), on animal houses, and to the Hidrographic Institute (IH), concerning vessels.

Though corresponding mainly to research organisations, and not so much to RIs, the recent creation of the INL and the Champallimaud Research Centre, mentioned under 2.4.1 above, is expected to play an important role in enhancing existing RIs, by enabling other research organisations to make use of their facilities and equipment.

Though taking into account European trends, including the ESFRI roadmap, the policy has been mainly driven by national goals and there has been no roadmap for building up new infrastructures. For the coming years, the budgetary restrictions might prevent a significant investment in the development of RIs.

3.2.2 National participation in the ESFRI roadmap. Updates 2009-2010

Portugal’s involvement in the ESFRI road-mapping exercise has been limited. So far no national roadmap has been put forward (ESFRI, 2009). The main argument is that ESFRI chiefly corresponds to a list of projects that has not been validated by the EU’s Council of Ministers. It is argued that a definition of the RIs for the future of Europe is needed, but the Roadmap has not provided the necessary means for such purpose. In addition, Portugal lacks the resources to engage in the process of financing the creation of new European RIs. In spite of that general attitude, FCT has supported the national research teams willing to participate in preparatory stages for
the establishment of new European RIs. In particular, different types of support have been provided to enable such teams to apply for financing in the scope of the FP. According to the 2008 annual report of FCT, financing was provided to the participation in ESFRI in social and human sciences, environmental sciences, energy, life sciences and biomedicine, and materials. Having said this, it should be remarked that the programme of the present Government stated an intention of participating fully in international research organisations.

3.3 Strengthening research institutions
The ERA green paper highlights the importance of excellent research institutions engaged in effective public-private cooperation and partnerships, forming the core of research and innovation 'clusters', mostly specialised in interdisciplinary areas and attracting a critical mass of human and financial resources. The Universities/research institutions should be embedded in the social and economic life where they are based, while competing and cooperating across Europe and beyond. This section gives an overview of the main features of the national higher education system, assessing its research performance, the level of academic autonomy achieved so far, dominant governing and funding models.

3.3.1 Quality of National Higher Education System
Most of the research activities carried out in Portugal is clustered around the universities. Apart from the government labs, which have been declining since the 1980s, universities were the natural working place for someone wishing to follow a research career. Since the late 1970s/early 1980s an important sector of non-profit research organisations emerged. These operate within or in the vicinity of the most important public universities.

In 2009 the fraction of GERD performed by the Higher Education (HE) sector was 35%, which is less that the 40% plus it used to be in the early 1990s. This relative decline has to do with the recent fast growth of BERD and it has happened while HERD and the HERD/GDP ratio kept rising in recent years.

The HE system in Portugal is composed of 15 public universities, 15 public polytechnics and 9 other non-integrated institutions, beyond around 130 private institutions. These public and private institutions offer a total of about 4,000 undergraduate and graduate programmes which were attended in the academic year 2009/2010 by 383,000 students (3.6% of the Portuguese population). The large majority of these students are in the public sector, but the private sector has played an important role, though decreasing in recent years. In academic year 2008/2009 a total of 78,569 students graduated from HE, women holding the majority share (59%).

In what concerns the supply of new PhDs, Portugal has moved along a rising curve, from less than 80 per year in the early 1970s up to about 1,500 by the end of the 2000-2009 decade. These figures include the domestic supply plus those who did their PhD abroad but had it recognised by Portuguese universities. However, despite past steep growth, the total output of new PhDs has stabilised in recent years.

The structure of the HE system reflects in part different functions. Some of the regional universities have been performing quite well and have caught up with the older universities in research productivity and reputation. At the same time the traditional universities have also evolved, by investing in the professionalization of
their staff, by developing research and by incorporating to a certain extent the “third mission” of collaboration with external institutions. Of the total 15 public universities there are 6 on which most of the research is concentrated, this smaller group performing according to high standards. However, and despite a few areas of excellence and the rise in scientific productivity, there are so far no world-class universities in Portugal, the dispersion and small size of most of them being a possible hindrance to exploit economies of scale and gaining international visibility.

Students are allocated to the HE institutions in accordance to a formula that weights the performance in their respective secondary schools and in national examinations. The attractiveness of the Portuguese HE institutions reflects the universities-polytechnics divide, the rankings in terms of scientific output and, above all, the perceived employability opportunities and prospective earnings of new graduates. On the top of the preferences of students entering HE are the Medicine schools. Engineering and natural sciences schools, despite normally having higher research productivity, display less attractiveness. This reflects the perception of students about opportunities for careers in S&T, but also the avoidance of mathematics or physics as study subjects.

The research output in Portugal has closely followed the dramatic increase in both the number of PhD holders and researchers, with ISI publications growing from less than 350 per in the early 1980s up to 7,470 in 2009 (GPEARI, 2008 and 2010a). In this context, the proportion of publications as co-authorships with researchers from other countries has been rising steadily, from 39% in 1990 to 49% in 2008.

In 2007 the Portuguese government set up the Agency for Assessment and Accreditation of Portuguese Higher Education (A3HE), whose activity so far has been concentrated on the pre-accreditation of new programmes and on the preliminary accreditation of study programmes already in operation.

The 2009 review of the statute of the universities’ teacher’s career has introduced an important novelty, imposing internal assessment mechanisms in each university. The evaluations to be carried out every 3 years will focus on 4 dimensions of universities’ staff activities, respectively: teaching; research; extension activities; and participation in the university’s administration. The universities have meanwhile set up regulations on how to implement these evaluations. In future, staff performing poorly in two successive evaluation exercises might be removed from the academic career.

### 3.3.2 Academic autonomy

Academic autonomy of universities has been a principle adopted by Portugal since the 1974 revolution. This has also involved a certain managerial autonomy, as universities (and polytechnics) have internal mechanisms to appoint their government bodies. However HE institutions have heavily depended on government funding.

This situation has been changing fast in recent years. With the advancement of the Bologna process, universities have been pressed to seek alternative sources of funding, as public funding has been reduced. Another important mark in changing the HE institutions context has been the passing of a new Law on Higher Education, RJIES, in September 2007. Its headlines were presented in earlier reports (see Godinho & Simões, 2008 and 2009). Portuguese universities have a tradition of considerable management autonomy, and this is expected to be continued under RJIES. However, most of the funds universities receive from the public budget cover operational costs, namely the staff salaries and other intermediate consumption.
These funds have been complemented by other sources, i.e. students’ fees and services offered to the communities in which the universities operate. Typically the research funding is not administered by the universities themselves, but by the research centres and research institutes that were established in connection to them.

The level of support to these research units depends on the quality of the research performed. Their activities are systematically and periodically subject to review and appraisal by scientific peers, including foreign researchers and national researchers working in foreign universities or research institutes. The last evaluation exercise focused on the activities performed in 2003-2006.

### 3.3.3 Academic funding

The funding of the universities has depended primarily on their areas of specialisation. Medical schools, for instance, get in relative terms more funding than social sciences faculties. Apart from this, funding depends also significantly on the balance between the number of graduates and the proportion of dropouts. The number of Master and PhD programmes in the university has a similar positive effect on funding, as well as the ratio of academic staff holding PhD degrees.

**Competitive funding for universities’ teaching** was introduced for the first time in 2009. It is still a small amount of money compared with the overall university budget, since the funds allocated to this mode of financing represent around 2% of the funding of operational costs. The criteria linked to this competitive funding are qualitative and in line with those noted in the paragraph above.

This suggests that Portuguese universities are evolving to a dual university funding system, with a split between block grant and competitive funding. The expectation is, according to announced Government intentions, that dual funding will be intensified in the coming years.

### 3.4 Knowledge transfer

The importance of knowledge dissemination and exploitation in boosting competitiveness and contributing to the effectiveness of public research has been increasingly recognised by EC and EU Member States. Following the publication of the [ERA Green Paper](https://doi.org/10.2775/9783905922673) in April 2007, the EC Communication "Improving knowledge transfer between research institutions and industry across Europe" was issued, highlighting the importance of the effective knowledge transfer between those who do research, particularly HEIs and PROs, and those who transform it into products and services, namely the industry/SMEs.

Several Member States have taken initiatives to promote and facilitate knowledge transfer (for instance new laws, Intellectual Property (IP) Rights regimes, guidelines or model contracts) and many others are planning to intensify their efforts in this direction. However, these initiatives are often designed with a national perspective, and fail to address the transnational dimension of knowledge transfer. This section will assess the national policy efforts aimed to promote the national and transnational public-private knowledge transfer.

#### 3.4.1 Intellectual Property Policies

The Portuguese legal framework regarding IP rights related to research results is incomplete. While the statute of the research career for research personnel working...
in the national laboratories has specific provisions regarding this issue, the statute of the universities’ teachers career is almost devoid of references to IP rights.

The statute of the research career imposes the co-ownership of patents or industrial designs by both the institution and the inventor (or the inventing team). This means that all the income stemming from the exploitation of the inventions shall be divided in equal shares by the employing institution and the inventor or the inventing team. The statute of the universities’ teachers career has only one reference to IP rights, in its article 63th-A, stating that the copyright of any pedagogic materials produced by the teaching staff while working at the higher education institutions is reserved to the authors. As the statute of the universities’ teachers career makes no explicit references to IP rights related to technological or design inventions, this means that this situation falls under the general laws of the country, namely the Code of Industrial Property, which grants the rights to the employer and only indicates that inventors shall be compensated with a fair amount of the potential invention profits. The lack of specific provisions regarding university patents has left a certain void which universities have tried to fill by issuing internal regulations regarding IP rights, namely in relation to research results.

Academic awareness on IP issues has been stimulated by specific government policies since the early 2000s. The two most important of such measures were the promotion of the Industrial Property Supporting Offices (GAPI network) and the support for the establishment of TTO in universities and polytechnic institutes (OTIC initiative). More recently there was an initiative called GAPI 2.0 which aimed at merging some of the smaller GAPI offices to provide each support to a larger number of universities. Despite appropriate funding being initially offered to the GAPI and OTIC offices, this has meanwhile dried up. Even so both types of structure have been able to survive and keep working. The emergence of these structures happened at the same time has a small boom in academic patenting arose.

3.4.2 Other policy measures aiming to promote public-private knowledge transfer

Involvement of private sectors in the governance bodies of HEIs and PROs

As indicated above the new law regarding the legal statute of universities and polytechnics that was published in April 2009 (RJIES) has introduced significant changes in the governance of HEIs (Higher Education Institutions). Universities and their schools shall now appoint General Council of which a part of the members shall be drawn from outside the universities themselves; therefore, respected personalities, including people from the private business sector, have been invited to take part in the body which has now strategic control of the institutions. 3 out of the 15 existing public universities have decided to become foundations. The new foundations have to appoint a Council of Curators, composed of “five personalities of high merit and whose professional experience is recognised as very relevant” for the institution, the curators being nominate by the government under proposal of the university. This move represents a convergence with the Anglo-Saxon model where the chancellor is a personality typically without any previous connection whatsoever with the university.

Inter-sectoral mobility

Portugal has not enjoyed a culture of mobility between the public and the private sectors. With the exception of very high-level cases of mobility circulation of people
has not been that common. Normally those who join the public sector at early stages of their careers tend to favour job security. The universities and the public research labs have not been an exception to this norm. The review of the university career statute in 2009 has made easier mobility, but the changes did not go so far as anticipated. The opposite mobility, from the private sector to the public sector, has still been more uncommon. However, the possibility of bringing in individuals with significant experience from the private sector has been increasing, as it was highlighted in the point above in relation to the universities’ General Councils and Councils of Curators.

In relation to the academic career in universities and in public research labs, it shall be noted that two situations were envisaged regarding the salaries to be paid, which have been with or without “exclusivity”. This means that those who opt to dedicate all their professional effort to their institutions benefit from “exclusivity” pay, while those who involve in consultancy and other external paid activities will lose 1/3 of their salaries. This circumstance has acted as a barrier for researchers' involvement with industry. With increasing autonomy this situation might change, as the universities manage the consultancy of their staff paying that extra work together with their salaries (and thus not discounting the “exclusivity” premium) while retaining a proportion of the external earnings as “overheads”.

Promoting research institutions - SME interactions

In the past, the main programme that has addressed the cooperation between academic institutions and industry was the so-called 'R&D Consortia'. In the present NSRF 2007-2013 this instrument has been substituted by the “Project in Co-Promotion”. This measure foresees non-reimbursable incentives of up to €1m for participating firms, with medium-sized firms gaining a 10% bonus and small-sized firms a 20% bonus. The conclusion is that this measure might not have a significant extra-incentive for SMEs getting involved with the research infrastructure entities.

EU cohesion policy

The present NSRF has not elected as a central issue the support for science and technology parks or incubators. In the past this sort of measure was envisaged as a priority and it reached some relevance in the context of the Portuguese CSF and the national research and innovation policy. Now this sort of support is being granted through the NSRF Regional Operational Programmes.

Spin-offs

Several initiatives have been taken to promote the establishment of new technology-based firms. In the previous CSF the two most important of such measures were NEOTEC, designed to support early-stage phases of technology-based entrepreneurial projects, and NEST (“New Technology Based Companies”). Nowadays, the main measure in this regard is the ‘Skilled Entrepreneurship’ under the Innovation Support System of ‘Compete’, which is part of NSRF 2007-2013. However, this measure does not exclusively address new R&D performing firms.

In what regards mechanisms addressing the capital needs of new technology-based firms, one shall refer to the creation of FINICIA in 2006, a programme through which government shares the risk with venture-capital firms and other financial agents by providing guarantees to the new firms seeking capital.
3.5 **Cooperation, coordination and opening up national research programmes within ERA**

The articulation between the R&D Framework Programmes, the Structural Funds and the Competitiveness and Innovation Programme is still underdeveloped in terms of coordination, synergies, efficiency and simplification. The policy fragmentation at EU and national level and between EU and national policies can hinder the build of critical masses of research excellence, leads to the duplication of efforts, sub-optimal impacts of the different instruments and unnecessary administrative overheads. Differences between research selection procedures and criteria can also be an obstacle to the overall spread of excellence. This section assesses the effectiveness of national policy efforts aiming to improve the coordination of policies and policy instruments across the EU, all part of the drive to create an integrated ERA.

3.5.1 **National participation in intergovernmental organisations and schemes**

Portugal has pursued the participation in COST in 2009-10. Unfortunately, the last information available regards 2008 (FCT, 2009). In that year Portugal has been involved in 32 new actions. Financial data is not available.

Participation in EUREKA has been since long an important feature of Portugal’s S&T policy. Portugal has been actively involved in the international extension of EUREKA activities, namely in the creation of EUREKA Asia and Iberoeka. According to the information available at the EUREKA website, by November 2010, there were 68 running projects, starting in 2009-2010, with Portuguese participation. This corresponds to a relatively high share in EUREKA projects. Such involvement cannot be dissociated from the Portuguese EUREKA Presidency in 2008-2009.

Information delivered by GPPQ (GPPQ, 2010a) indicates that over 2007-2009 Portuguese players have been involved in 605 FP7 projects, having a leadership role in almost 20%. The participation is evenly spread between Universities (26.6%), R&D organisations (25.7%) and companies (29.9%). Contractualised funding slightly exceeds €175m. This corresponds to less than 1.2% of total.

In the Council, Portugal did not vote in favour of the ERIC – European Research Infrastructure Consortia regulation proposal as the proposal required the involvement of at least 3 countries in new ERIC projects. This position may be related to the fact that Portugal has been investing recently in a new infrastructure, the INL – International Iberian Nanotechnology Laboratory.

As mentioned by Godinho & Simões (2009), FCT holds the Portuguese representation at several international research infrastructures, namely those that are part of the EIROforum: CERN, EFDA, EMBL, ESA, ESO, and ESRF. Portugal also participates in the following research infrastructures: EMBC, EMBO, GBIF (Global Biodiversity Information Facility), and EurOcean. Further information on these participations is provided on the FCT website.

3.5.2 **Bi- and multilateral agreements with other ERA countries**

Portugal has bi-lateral agreements with other ERA countries. So far, these are mainly aimed at promoting the mobility of researchers. Most recent calls include provisions, often mandatory, concerning the involvement of young researchers. The idea is to enlarge participation, while avoiding the crystallization of research groups. Agreements were established with 10 EU member states.
Besides the research cooperation with these countries, Portugal also has cultural agreements with other ERA countries, namely Bulgaria, Greece, Ireland, Luxemburg and Romania. These provide *inter alia* for the financing of the mobility of researchers in the context of joint research projects.

An emerging trend is the development of bilateral cooperation to carry out joint research initiatives, and not just the traditional support to researchers’ mobility. A new generation of bi- or even multi-lateral agreements, including the launching of joint calls, is emerging. Joint initiatives have already been taken with other European countries to promote joint research projects in some specific fields. In the wake of the creation of INL, a joint programme was launched with Spain to promote cooperative research projects in nanosciences and nanotechnologies. Another example is the cooperation agreement between Portugal, Spain and France to launch a call for joint projects in the field of knowledge-based bio-economy (KBBE).

### 3.5.3 Other instruments of cooperation and coordination between national R&D programmes

The backdrop for Portugal’s involvement in other instruments of cooperation and coordination between national R&D programmes is the objective of fostering the internationalization of the S&T system. However this has not been translated into clear guidelines for focusing participation in specific instruments or activities. This is related to the broad range approach followed with regard to research financing in general. Therefore, involvement in the various instruments resulted more from bottom up initiatives by the disciplinary research communities. Nevertheless, the results are reasonable, particularly on what concerns ERA-NETs. A brief presentation of Portuguese participation in the various instruments is provided below.

**ERA-NETs**: Portugal has been very active in this field. FCT has participated in 29 ERA-NETs in 2010⁵, an increase of 4 ERA-NETs with regard to 2009. Besides participation by FCT, AdI, UMIC and other organisations are also involved in a few ERA-NETs. This is the activity where Portugal has been able to obtain the highest funding share from FP7, according to data disclosed by GPPQ. Typically, the financial contribution from FCT ranges between €200-400,000. Criteria for deciding to participate in ERA-NETs are mainly related to research excellence of the Portuguese ERA-NET ‘champions’ as well as to the existence of a critical research mass in Portugal. The decision to participate in ERA-NETs is taken on the basis of the advice provided by FCT’s disciplinary Scientific Advisory Committees. ERA-NETs were, according to the information disclosed by GPPQ, the area where the share of funding got by Portugal was the highest with regard to the average level of Portuguese contribution. This may be envisaged as a positive outcome of ERA-NETs from the Portuguese standpoint. An additional positive feature is, of course, the promotion of European research cooperation. On the other hand, the impact of ERA-NETs in the dissemination of good evaluation practices has been relatively limited, since FCT already followed international practices.

**Initiatives under Art. 185 of the Treaty of Lisbon**: Two initiatives deserve mention: Eurostars, and Ambient Assisted Living (AAL). With regard to Eurostars, Portuguese participation is coordinated by AdI. By November 2010 there were 11 projects involving Portuguese organisations, with a total estimated cost of €12.3m. The assessment made by AdI is positive, as participation has exceeded expectations.

---

⁵ Besides these, FCT has already signed agreements to participate in a few more ERA-NETs
AAL is aimed at carrying out European R&D projects in the area of intelligent ambient assisted living based on ICT. The national coordination was assigned to UMIC, the Knowledge Society Agency. Financing is granted by FCT. From Portugal’s standpoint, AAL is closely related to one of the vectors of the partnership agreement set up with Fraunhofer Gesellschaft. In the first two AAL calls five projects with Portuguese participation were approved, involving 22 Portuguese organisations, and corresponding to around 8% of approved projects.

**Participation in activities supported by the European Science Foundation:** Two Portuguese organisations are members of the European Science Foundation (ESF): FCT and the Lisbon Academy of Sciences. Both are currently participating in various programmes and initiatives carried out by ESF. FCT is involved in the following activities: Exploratory Workshops; Research Networking Programmes; ESF Research Conferences; EuroBioFund; and EUROCORES.

EUROCORES is probably the area where Portugal’s involvement is stronger. They provide a framework to promote collaborative research, networking and dissemination in broad and complex research topics at the European level and in a global context. FCT has provided funding for, and participated in, the following running EUROCORES: EuroSTRESS, on stress and mental health; TOPO-EUROPE, dealing with the evolution of 4D topography; and EuroMARC, on marine research. FCT has also participated in three completed EUROCORES: EuroCLIMATE, on climate variability and the carbon cycle; EuroSCOPE, on protein production; and EuroMARGINS, dealing with modelling the physical, chemical and biological processes in the European passive continental margins.

**European public-private partnerships:** The main initiatives in this context are the European Technology Platforms (ETPs) and the Joint Technology Initiatives (JTIs). The first ETPs were launched in 2002-2003. Their importance has increased, and nowadays they are envisaged as key initiatives in the context of the public-private partnerships in the context of the Economic Recovery Plan and the implementation of the European Strategic Plan for Energy Technologies (SET-Plan). According to information provided by GPPQ (2010 b), the three ETPs in which Portuguese organisations have been more successfully involved were the following: Manufacture, an old platform aimed at promoting the development of manufacturing technologies; Networked and Electronic Media (NEM), focussed on the convergence of media, communications, consumer electronics, and IT as an opportunity for future growth; and eMobility, on mobile communications. Experience suggests that to achieve important roles in the context of ETPs requires an early involvement in the process of designing the platform. “The results of the first calls for public-private partnerships, in 2009, (...) clearly show that Portugal only achieves good results in those platforms in which there are active Portuguese members” (GPPQ, 2010 b).

In what concerns JTIs, they are aimed at the implementation of the Strategic Research Agendas of a limited number of ETPs. The first six JTI, approved during the Portuguese Presidency, are the following: Innovative Medicines Initiative (IMI), Embedded Computing Systems (ARTEMIS), Aeronautics and Air Transport (Clean Sky), Nanoelectronics Technologies 2020 (ENIAC), Hydrogen and Fuel Cells Initiative (FCH), and Global Monitoring for Environment and Security (GMES). Portugal has been among the founding members of ARTEMIS, ENIAC and IMI. ARTEMIS is focused on embedded computing systems. Dealing with nanotechnologies, ENIAC is in line with Portugal’s research policy objective of stimulating research in that field. The Portuguese contribution to ARTEMIS and ENIAC reached €0.8 and €0.5m, respectively. The participation in IMI has been
promoted by GPPQ among both companies and research centres, namely the Health Cluster Portugal, a CTP specialized in the health industry, was developed.

**Joint Programming (JP) Initiatives**: The action “Towards joint programming in research: Working together to tackle common challenges more effectively” is one of five JP initiatives planned by the Commission in 2008 as a follow-up of the Green Paper on ‘The European Research Area: New perspectives’. JP is the process whereby Member States engage on a voluntary and *à la carte* basis in the definition, development and implementation of common research agendas addressing a specific field or topic.

However, the definition of the governance, the financing and the topics to be addressed is still under way. Portugal is involved in two JP initiatives, concerning marine research and the Alzheimer disease; but it also has observers in other JP initiatives. Portugal has expressed concerns about the development of JPs. From the Portuguese standpoint it is important to avoid excessive segmentation, which is not interesting for countries with small research communities. Nevertheless, JP is still in an embryonic phase, being too early to appraise national involvement.

**3.5.4 Opening up of national R&D programmes**

The internationalization of the Portuguese research system has been, as mentioned above, one of the key tenets of S&T policy. This has been translated namely in the so-called ‘Partnerships for the Future’ (namely with several US universities), and in the involvement in a number of initiatives in the context of FP7.

One of the features of such internationalisation is an increased effort towards the attraction of non-national researchers. As reported in 2.4.1, more than 40% of the researchers recruited under the ‘Commitment to Science’ programme were non-nationals. This internationalization of human resources is entailing significant changes in the behaviour and networking of a number of Portuguese research organisations. The ‘Welcome II Portugal’ programme is aimed at encouraging the recruitment of European post-doc researchers which have been working for the last three years in third countries. This programme is managed by FCT and is partially financed by the FP7 Marie Curie Action COFUND, being endowed with a budget of €12.5m. Selected applicants will sign a 3-year employment contract with the Portuguese research organisation providing a position.

With regard to the foreign participation in national research programmes, the key principle is one of residence, and not of nationality. Therefore, foreign researchers resident in Portugal (i.e. working in a Portuguese University or research organisations) are treated on the same footing as their Portuguese colleagues.

The creation of the INL has also been an important step towards internationalisation. Though being a joint venture between Portugal and Spain, INL has an international status, aiming at becoming a key player in the EU’s research in nanosciences and nanotechnologies.

As pointed out above there is an emerging trend toward the development of new bi- and multilateral cooperation approaches to launch joint initiatives, including the opening up of national research programmes to other countries. A reference is due to the cooperation between Portugal, Spain and France to launch a call for joint projects in knowledge-based bio-economy (KBBE). Regarding cooperation with non-EU partners, the main initiative concerns the partnerships with US universities, which were mentioned above.
3.6 International science and technology cooperation

In 2008, the European Commission proposed the Strategic European Framework for International Science and Technology Cooperation to strengthen science and technology cooperation with non-EU countries. The strategy identifies general principles which should underpin European cooperation with the rest of the world and proposed specific orientations for action to: 1) strengthen the international dimension of ERA through FPs and to foster strategic cooperation with key third countries through geographic and thematic targeting; 2) improve the framework conditions for international cooperation in S&T and for the promotion of European technologies worldwide. Having in view these aspects, the following section analyses how national policy measures reflect the need to strengthen the international cooperation in S&T.

3.6.1 International cooperation

The main initiative of international S&T cooperation outside the framework of ERA is the ‘Partnerships for the Future’ programme. As indicated in previous Country Reports (Godinho & Simões, 2008 and 2009), this initiative involves the development of joint programmes with the following US organisations: MIT; Carnegie Mellon University; University of Texas at Austin; and the University of Harvard.

Portugal, through FCT, has participated in ERA-NETs concerning scientific cooperation with third countries. One of the most relevant was EULANEST, with Latin American countries. In the context of this ERA-NET, a detailed mapping of the best practices and cooperation strategies was undertaken. A joint call for research projects in fields of common interest was issued. This initiative came to an end in June 2010. Portugal participates also in other geography-oriented ERA-NETs, namely those related to India (New INDIGO) and Africa (AfricaNet).

Portugal is, since 1984, member of the Ibero-American Programme of Science and Technology for Development (CYTED). It involves Portugal, Spain and 19 Latin American countries. The purpose is to promote cooperation in different areas. There are two main types of projects: thematic networks, and research consortia. The main S&T fields covered in the context of CYTED are the following: agrifood; health; manufacturing technologies; sustainable development, global changes and ecosystems; ICT; science and society; and energy. In 2009, it was decided to launch a new programme, aimed at promoting innovation (Ibero-America Inova).

As mentioned above, two initiatives in which Portugal played a relevant role concern the extension of EUREKA to Latin America (IBEROEKA) and Asia (EUREKA Asia).

Additionally, Portugal has cooperation agreements for the mobility of researchers with several non-ERA countries, namely the following: Argentina; India; Morocco; Serbia; and Tunisia. Cultural agreements with Algeria, Croatia, South Korea, India and Mexico also include provisions to promote the mobility of researchers. The cultural agreement with China deals only with Social Sciences research; although, in November 2010, a new scientific and technological cooperation agreement was signed. A particular reference is due to the cooperation with Brazil, since it is the most relevant with non ERA countries, except the US. FCT manages two agreements with Brazilian counterparts: one with the CAPES Foundation; and another with CNPq, the Brazilian research council. These agreements are mainly

---

6 Besides the cooperation with US organisations, the ‘Partnerships for the Future’ also include the creation of the INL and the agreement with Fraunhofer Gesellschaft for the creation of the Fraunhofer Portugal Institute, the first to be established outside Germany.
addressed to encourage researchers’ mobility. More recently, there has been a strengthening and enlargement of the cooperation: memorandums of understanding were signed to stimulate research cooperation in nanotechnologies and biodiversity, for instance. A reciprocal opening up of research programmes is envisaged.

3.6.2 Mobility schemes for researchers from third countries
Some of the researchers recruited under the initiative pointed out in 3.5.4 above were not nationals from ERA countries. Portugal is committed to attract more foreign researchers, namely from Third countries. An important decision taken to stimulate the training of researchers, and indirectly their mobility, concerns the creation of an UNESCO Centre for Sciences focused on the doctoral and post-doctoral education of young scientists from Portuguese speaking countries and aiming preparing them to become fully integrated in international research networks. This Centre is expected to combine the development of doctoral programmes with the provision of specific training on researchers’ social responsibility and public communication of science.

4 Conclusions

4.1 Effectiveness of the knowledge triangle
Portuguese research policy has followed a consistent path, aimed at internationalizing, strengthening and improving the quality of Portuguese research. Budgetary allocations to science and technology have experienced a growth trend and were approximately kept constant for 2011, in spite of heavy budgetary cuts. The measures taken in the period under review are consistent with those long term objectives. An interesting feature is the trend towards an increased targeting of research, in spite that the dominant picture is still one of broad range support.

The effort to strengthen scientific research has been to some extent done at the expense of budgetary allocations for HE. In spite of the ‘Higher Education Trust Agreement’ (Jan. 2010), a significant decline in the HE budget will take place. Positive steps towards the encouragement of university-industry-society cooperation were the new University statutes and the reviewed University career statute.

An integrated policy approach to the ‘knowledge triangle’ is lacking. Three years ago, the activity of the National Coordinator of the Lisbon Strategy and the Technological Plan, together with the definition of a policy coordination system of the 2007-2013 NSRF, led to the expectation that the traditional divide between science and enterprise policies might possibly be overcome. Unfortunately, this has not been the case. The discontinuation of the Technological Plan since 2009 and the ineffective political coordination of the NSRF have not enabled clear improvements in policy coordination along the ‘knowledge triangle’, particularly on what concerns research and innovation policies.

The table below provides a synthesis of the main developments with regard to ‘knowledge triangle’ policies, assessing the strengths and weaknesses.
<table>
<thead>
<tr>
<th>Table 3: Effectiveness of knowledge triangle policies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recent policy changes</strong></td>
</tr>
<tr>
<td>Research policy</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Innovation policy</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Education policy</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Other policies</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

### 4.2 ERA 2020 objectives - a summary

In general terms, most policy changes in the period under review are consistent with the strategic ERA objectives. The focus on research internationalisation and excellence is very much in line with those objectives.

Policy has been consistent with objective #1 and #2. A sustained concern with the supply of human resources for research is undeniable; the downside is researchers’ difficulty to find permanent jobs in the country. The increase in budgetary allocations has been consistent, and even the fact that the research budget has been kept constant for 2011 may be considered an achievement having in mind the severe budget cuts. However, the involvement of stakeholders in defining research objectives continues to be too limited. There is a trend towards European coordination of research funding, namely in the context of ERA-NETs and JTI, and

---

Page 44 of 51
the opening up of the research system, in convergence with objective #3. The creation of INL (and the private-owned Champallimaud Research Centre) is a very positive contribution to objectives #4 and #5. The strengthening of research organisations and the creation of improved framework conditions for private company R&D investments, namely through SIFIDE, are sustained features of Portugal’s research policy, thereby contributing to objectives #6 and #7. In contrast, despite the initiatives taken to promote objective #8, the results are still limited, namely due to the prevailing linear approach and the difficulties in fostering the dynamics of several clusters. A host of measures was taken in line with objectives #9 and #10, including the partnerships with US universities, the establishment of the UNESCO Centre for training of Portuguese-speaking researchers and the creation of INL. Portuguese contribution toward strengthening European attractiveness for researchers is clearly positive. The same happens with objective #12.

In contrast, the achievements with regard to structural change (#13) are relatively meagre. The inability to attract knowledge-intensive foreign investments and to develop a robust and dynamic VC industry has limited the possibilities to undergo a significant transformation of the industrial fabric. Of course, initiatives have been taken to prepare for a knowledge-intensive economy, namely regarding the spread of ICT. Policy initiatives to encourage research addressing societal challenges, including the environmental ones, were taken, in line with objective #14. The downside has to do with the lack of mechanisms aimed at stimulating the participation of the stakeholders and the society as a whole in defining research objectives on this regard. A final reference is due to the good record in furthering objective #15 on what concerns the diffusion of scientific culture.

To sum up, the headlines of research policy are positive and consistent. They are broadly in line with ERA 2020 objectives. Investment in science is generating fruits as scientific performance has been improving. Several problems, however, remain, namely: exploitability of research, involvement of stakeholders in the definition of research objectives, structural change, and ‘knowledge triangle’ policy coordination. The table below provides a summary of the main policy changes and strengths and weaknesses according to the 15 objectives in the vision 2020 for ERA.

Table 4: Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main policy changes</th>
<th>Assessment of national strengths and weaknesses with regard the specific ERA objective</th>
</tr>
</thead>
</table>
| 1 Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers | • Continuation of a strong investment of doctoral and post-doctoral education.  
• Profiting from the recruitment programme to attract foreign researchers.  
• Launch of the ‘Welcome II Portugal’ in order to attract European researcher with working experience in third countries.  
• Creation of two large internationally orientated laboratories. | • + Portugal is increasingly competitive for foreign researchers in the 30- to 40-years old cohort.  
• + High share of female researchers.  
• + Strong growth in the share of PhD holders in active population.  
• – Difficulty in generating employment and promising career prospects for young PhD holders. |
<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main policy changes</th>
<th>Assessment of national strengths and weaknesses with regard the specific ERA objective</th>
</tr>
</thead>
</table>
| 2 Increase public support for research | • Public S&T budget for 2011 has not declined with regard to 2010, in spite of the crisis.  
• Continuation of SIFIDE, the tax system to promote company R&D. | • + Budgetary decisions show a commitment to support R&D activities.  
• − Insufficient stakeholder involvement in the definition of S&T policy priorities.  
• − Weak concern with research exploitability. |
| 3 Increase European coordination and integration of research funding | • Participation in ERA-NETs and other European initiatives.  
• Bi- and multi-lateral cooperation with other ERA countries. | • + Positive contribution of ERA-NETs and other initiatives for an increased involvement of Portuguese research groups. |
| 4 Enhance research capacity across Europe | • Creation of INL. | • + Commitment to lead European research in dynamic fields (nanosciences and nanotechnologies).  
• + Iberian cooperation. |
| 5 Develop world-class research infrastructures (including e-infrastructures) and ensure access to them | • Creation of INL  
• Creation of Champalimaud Research Centre (this stems from a decision of a new well-endowed private foundation) | • + Contribution towards the development of international research infrastructures. |
| 6 Strengthen research institutions, including notably universities | • Consolidation of the support to research units and Associate Laboratories.  
• Evaluation of Associated Laboratories.  
• Launching of thematic research networks.  
• Reform of the Universities.  
• Review of the University career statute. | • + Promotion of quality and excellence standards in knowledge production.  
• + Stimulation of economies of scale and inter-disciplinary research.  
• + Opening of Universities to society.  
• + Increased opportunities for University-industry cooperation.  
• − Some knowledge held by government laboratories was lost.  
• − Reform of university teaching career statute more timid than expected. |
| 7 Improve framework conditions for private investment in R&D | • Measures to promote individual company and collaborative R&D projects in the context of the NSRF 2007-2013.  
• Continuation of SIFIDE.  
• Clusters initiative. | • + Improved conditions for companies to invest in R&D.  
• + Promotion of R&D cooperation around common themes.  
• − Excessive bureaucracy.  
• − Insufficient support and strategic follow up of the development of CTPs and clusters. |
<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main policy changes</th>
<th>Assessment of national strengths and weaknesses with regard the specific ERA objective</th>
</tr>
</thead>
</table>
| 8 Promote public-private cooperation and knowledge transfer | • Continued promotion of university-industry R&D consortia.  
• Clusters initiative.  
• Creation of the Technology Demand and Supply Marketplace. | • + Provision of opportunities for research organisations and companies to meet and cooperate.  
• − Linear approach, assuming that knowledge may be ‘transferred’ as such, instead of being shared and changed/adapted through interaction.  
• − Discontinuation of support to TTOs. |
| 9 Enhance knowledge circulation across Europe and beyond | • Sustained support to the internationalization of research.  
• Recruitment of foreign researchers.  
• ‘Partnerships for the Future’ with US Universities and Fraunhofer Gesellschaft.  
• Promotion of participation in FP7.  
• Creation of the UNESCO Centre for doctoral education of Portuguese speaking researchers. | • + Increased Worldwide openness of the Portuguese research system.  
• + Increased opportunities for (reciprocal) learning.  
• − Potential dispersion of effort.  
• − There may be a potential tension between the agreements with US universities and European research policy, since such partnerships address several areas with European value added. |
| 10 Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world | • Creation of INL (and launching of the private Champallimaud Centre).  
• Attraction of foreign researchers.  
• Creation of the UNESCO Centre for doctoral education of Portuguese speaking researchers. | • + All these initiatives contribute to improve Portugal’s role and attractiveness in European and worldwide research landscape. By the same token, they positively contribute to international cooperation and to enhance European research attractiveness and status. |
| 11 Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle | • Increased coordination of research and innovation policy measures under the 2007-2013 NSRF.  
• Cluster approaches.  
• Discontinuation of the Technological Plan. | • + Existence of new formal instruments for policy coordination  
• + Cluster policy as an instrument to put together the elements of the knowledge triangle.  
• − The institution of formal coordination mechanisms may not be enough to ensure effective coordination.  
• − The discontinuation of the Technological Plan deprived the government from effective mechanisms to ensure a proper coordination between research and innovation policies. |
<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main policy changes</th>
<th>Assessment of national strengths and weaknesses with regard the specific ERA objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 Develop and sustain excellence and overall quality of European research</td>
<td>• Continuation of the commitment to quality and excellence in research.</td>
<td>• + The focus on quality and excellence in research is one of the key strengths of Portugal’s research policy.</td>
</tr>
<tr>
<td></td>
<td>• Creation of INL (and launching of the Champallimaud Centre).</td>
<td>• + This has also positive implications for the quality and excellence of European research as a whole.</td>
</tr>
<tr>
<td>13 Promote structural change and specialisation towards a more knowledge-intensive economy</td>
<td>• Policy initiatives regarding the spread of ICT, the development of electrical mobility and research in nanotechnologies are aimed at promoting structural change and a drive towards a more knowledge-intensive economy.</td>
<td>• + Consensus about the need to invest in research and innovation to bring about structural change.</td>
</tr>
<tr>
<td></td>
<td>• Concern with the development of, and research on, renewable sources of energy.</td>
<td>• + There is an increasing crust of internationally competitive knowledge-intensive firms.</td>
</tr>
<tr>
<td></td>
<td>• + There is a partial overlap between Portugal’s research targets and the “grand challenges” of the Lund Declaration.</td>
<td>• + A public procurement policy seems to be emerging.</td>
</tr>
<tr>
<td></td>
<td>• − The move has been too slow to bring about clear structural change.</td>
<td>• − Insufficient capacity to attract knowledge- and R&amp;D-intensive FDI.</td>
</tr>
<tr>
<td>14 Mobilise research to address major societal challenges and contribute to sustainable development</td>
<td>• Increased focus on research targeted to societal challenges.</td>
<td>• + There is a sustained commitment to the diffusion of scientific culture, namely through the ‘Ciência Viva’ initiative.</td>
</tr>
<tr>
<td></td>
<td>• Concern with the development of, and research on, renewable sources of energy.</td>
<td>• + Significant improvements in the use of renewable sources of energy.</td>
</tr>
<tr>
<td></td>
<td>• − Lack of involvement of stakeholders and the society as a whole in the identification of the key societal challenges to be addressed by research policy.</td>
<td>• − Insufficient capacity to attract knowledge- and R&amp;D-intensive FDI.</td>
</tr>
<tr>
<td>15 Build mutual trust between science and society and strengthen scientific evidence for policy making</td>
<td>• Sustained commitment to the diffusion of scientific culture, namely through the ‘Ciência Viva’ initiative.</td>
<td>• + Diffusion of scientific culture</td>
</tr>
<tr>
<td></td>
<td>• + Improved capacity to attract youngsters to follow scientific careers.</td>
<td>• + Improved capacity to attract youngsters to follow scientific careers.</td>
</tr>
<tr>
<td></td>
<td>• − In spite of some improvements, the use of scientific evidence for policy making remains limited.</td>
<td>• − Insufficient capacity to attract knowledge- and R&amp;D-intensive FDI.</td>
</tr>
</tbody>
</table>
References


IESE/Quaternaire Portugal (2010): Relatório de Avaliação do Quadro de Referência Estratégico Nacional, Lisboa: Observatório do QREN.


List of Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BERD</td>
<td>Business Expenditures for Research and Development</td>
</tr>
<tr>
<td>CERN</td>
<td>European Organisation for Nuclear Research</td>
</tr>
<tr>
<td>COST</td>
<td>European Cooperation in Science and Technology</td>
</tr>
<tr>
<td>COTEC</td>
<td>Business association to promote innovation</td>
</tr>
<tr>
<td>CTP</td>
<td>Competitiveness and Technology Pole</td>
</tr>
<tr>
<td>EFDA</td>
<td>European Fusion Development Agreement</td>
</tr>
<tr>
<td>EMBC</td>
<td>European Molecular Biology Conference</td>
</tr>
<tr>
<td>EMBL</td>
<td>European Molecular Biology Laboratory</td>
</tr>
<tr>
<td>EMBO</td>
<td>European Molecular Biology Organisation</td>
</tr>
<tr>
<td>ERA</td>
<td>European Research Area</td>
</tr>
<tr>
<td>ERA-NET</td>
<td>European Research Area Network</td>
</tr>
<tr>
<td>ERP Fund</td>
<td>European Recovery Programme Fund</td>
</tr>
<tr>
<td>ESA</td>
<td>European Space Agency</td>
</tr>
<tr>
<td>ESA</td>
<td>European Space Agency</td>
</tr>
<tr>
<td>ESFRI</td>
<td>European Strategy Forum on Research Infrastructures</td>
</tr>
<tr>
<td>ESO</td>
<td>European Southern Observatory</td>
</tr>
<tr>
<td>ESRF</td>
<td>European Synchrotron Radiation Facility</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>EU27</td>
<td>European Union including 27 Member States</td>
</tr>
<tr>
<td>EurOcean</td>
<td>European Centre for Information on Marine Science and Technology</td>
</tr>
<tr>
<td>FCT</td>
<td>Portuguese S&amp;T Foundation</td>
</tr>
<tr>
<td>FDI</td>
<td>Foreign Direct Investments</td>
</tr>
<tr>
<td>FP</td>
<td>EU Framework Programme for Research and Technology Development</td>
</tr>
<tr>
<td>FP</td>
<td>Framework Programme</td>
</tr>
<tr>
<td>FP7</td>
<td>7th Framework Programme</td>
</tr>
<tr>
<td>GAPI</td>
<td>Offices for Industrial Property Promotion</td>
</tr>
<tr>
<td>GBAORD</td>
<td>Government Budget Appropriations or Outlays for R&amp;D</td>
</tr>
<tr>
<td>GBAORD</td>
<td>Government Budget Appropriations or Outlays on R&amp;D</td>
</tr>
<tr>
<td>GBIF</td>
<td>Global Biodiversity Information Facility</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GERD</td>
<td>Gross Domestic Expenditure on R&amp;D</td>
</tr>
<tr>
<td>GOVERD</td>
<td>Government Intramural Expenditure on R&amp;D</td>
</tr>
</tbody>
</table>
GPEARI MCTES department in charge of R&D statistics
GPPQ Portuguese department for the promotion of the FP
GUF General University Funds
HE Higher education
HEI Higher education institutions
HERD Higher Education Expenditure on R&D
INL Iberian International Nanotechnology Laboratory
IP Intellectual Property
MCTES Portuguese Ministry of S&T and Higher Education
NSRF National Strategic Reference Framework
OECD Organisation for Economic Co-operation and Development
PRO Public Research Organisations
R&D Research and development
RI Research Infrastructures
RJIES Law regulating the Portuguese HE institutions
RTDI Research Technological Development and Innovation
S&T Science and technology
SF Structural Funds
SIFIDE Fiscal credits to R&D (Portuguese policy measure)
SME Small and Medium Sized Enterprise
VC Venture Capital